SCIENTIFIC AMERICAN

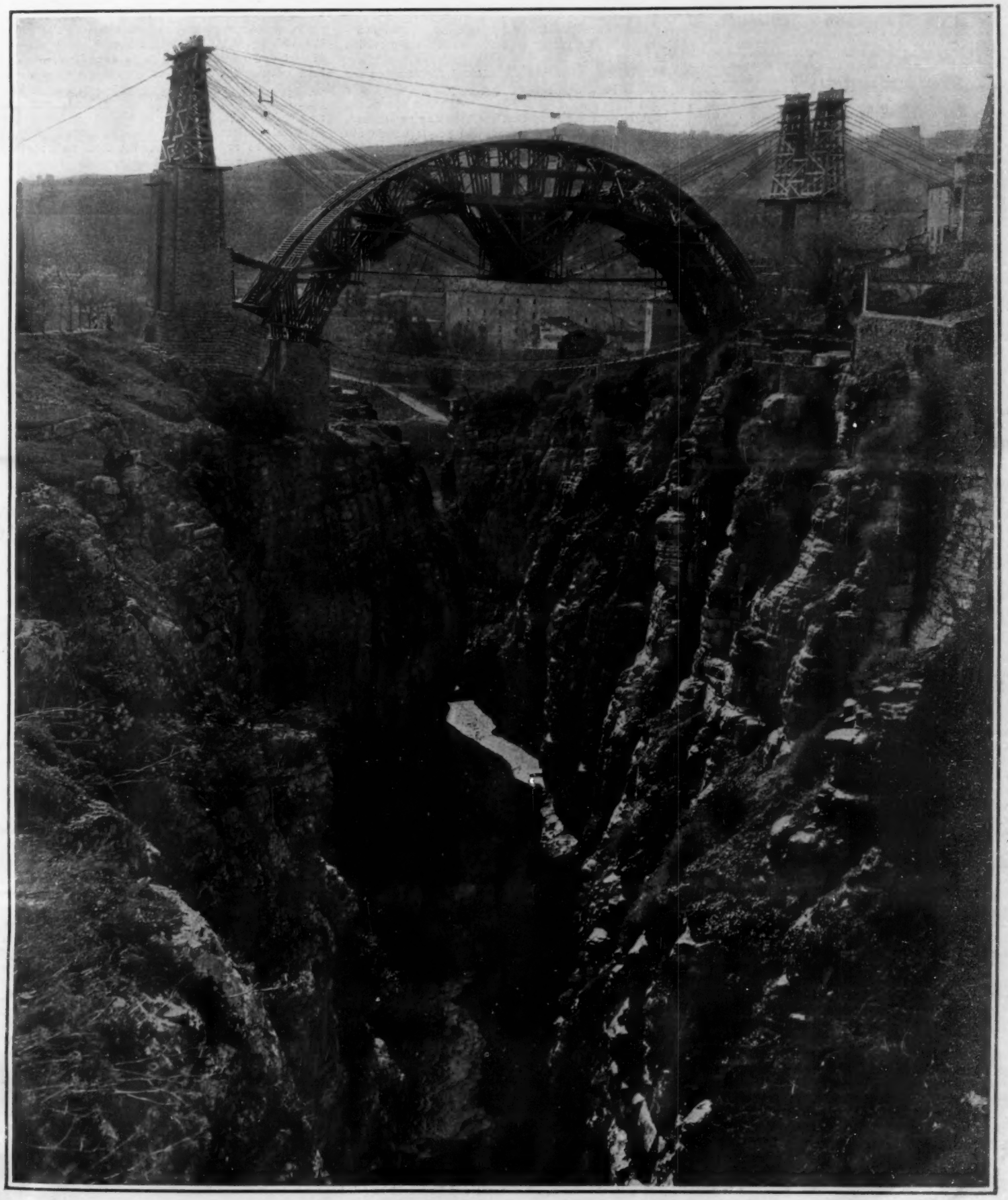
[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1910, by Munn & Co., Inc.]

A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

Vol. CIII.—No. 2.
ESTABLISHED 1845.

NEW YORK, JULY 9, 1910.

10 CENTS A COPY.
$3.00 A YEAR.



The new bridge at Constantine, Algeria. The highest masonry bridge in the world.

THE TWO HIGHEST MASONRY BRIDGES IN THE WORLD.—[See page 25.]

SCIENTIFIC AMERICAN
ESTABLISHED 1845

MUNN & CO., Inc., Editors and Proprietors

Published Weekly at
No. 361 Broadway, New York

CHARLES ALLEN MUNN, *President*
361 Broadway, New York.
FREDERICK CONVERSE BEACH, *Sec'y and Treas.*
361 Broadway, New York.

TERMS TO SUBSCRIBERS.

Subscription one year $3.00
Postage prepaid in United States and possessions Mexico, Cuba and Panama.
Postage to Foreign countries ..... $1.50 per year extra.
Canadian postage ..... .75 per year extra.

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (established 1845) ..... $3.00 a year
Scientific American Supplement (established 1876) ..... 5.00 "
American Homes and Gardens ..... 3.00 "

The combined subscription rates and rates to foreign countries, including Canada, will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., Inc., 361 Broadway, New York.

NEW YORK, SATURDAY, JULY 9th, 1910.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

ANNOUNCEMENT OF RULES FOR THE GOULD-SCIENTIFIC AMERICAN $15,000 PRIZE.

ON page 27 of this issue we publish the rules which will govern the contests for the $15,000 prize which Mr. Edwin Gould has so generously offered for competition through the medium of the SCIENTIFIC AMERICAN.

As finally drafted, they embody many valuable suggestions which have been received both from the leading aviators of the country and from many of the investigators whose laboratory researches have contributed to the pre-eminence of this country in the art of mechanical flight.

It has been our endeavor to draft the conditions upon such broad lines that the contestants may work with a free hand, and any individual, whether he belong to an aeronautical club or not, may be entitled to enter the competition.

In view of the many letters that have been received requesting pecuniary assistance in the construction of machines intended for this competition, we take this opportunity to state that neither Mr. Gould nor the SCIENTIFIC AMERICAN is prepared to enter into any arrangements of this character. It is believed that the sum of $15,000 is sufficient to cover the cost of construction and leave a handsome margin for the winner.

LESSONS OF THE ZEPPELIN AIRSHIP DISASTER.

PROFOUND and universal will be the sympathy accorded to that courageous and ill-fated inventor, Count Zeppelin, because of his third great airship wreck, which occurred at the very time when he seemed to be achieving a well-earned success. Elsewhere in this issue will be found a discussion of the disaster by one who is thoroughly familiar with the airships of the Zeppelin type. The "Deutschland," as she was called, was the creation of an engineer, and into her had been built some of the best theoretical and mechanical genius of the German people.

The failure, therefore, cannot be put down to poor design or faulty workmanship. We must look elsewhere for its cause, which is to be found, according to our view of the case, partly in the insufficient subdivision of the motive power—a feature which the GOULD-SCIENTIFIC AMERICAN Contest is designed to eliminate from the aeroplane; and, also, in the absence of aerial moorings to which the mammoth structure might have tied up and ridden out the gale with some assurance of safety. The motive power was divided between three motors. Apparently one of these gave out, leaving to the others the formidable task of holding the ship head to the wind and under steerage control, a task to which they proved unequal. Had the power been distributed among five or six engines, the "Deutschland" would have had a fair chance to ride out the summer gale.

Of even greater importance, if airship travel is to be done over specified courses and according to schedule, is the provision, at fairly frequent intervals, of what might be called aerial anchorage posts, consisting of lofty, latticed steel towers, provided at the top with a large ring or other suitable device, to which grappling hooks, flung from the nose of the dirigible, could be made fast—the maneuver corresponding to that of a yacht when she picks up her moorings in a roadstead or harbor. Had such moorings been available, the "Deutschland" as she drifted to leeward, with most of her motive power in operation, would have had sufficient steerage way to afford her a reasonable chance of bringing her bow, as she drifted past the tower, sufficiently near to make a cast with the grapplings.

The loss of these three costly vessels proves to a demonstration that they must never come to ground except to enter the shelter of a housing shed; for when they are once afloat, it is even more dangerous for them to "touch bottom" than it is for a steam or sailing ship.

We must not be too greatly discouraged by the loss of the "Deutschland." Multiple-unit engines and suitable anchorages, costly though the latter must be, will go far to establish airship travel on a reasonably safe basis.

THE MENACE OF ROOF SIGNS AND WATER TANKS.

UNFORTUNATELY for the victims, it would sometimes seem as though loss of life were necessary to reveal certain dangers which should be so obvious, that he who runs may read. Conspicuous among these is the practice of erecting upon the roofs of buildings, structures of wide area and great weight, which were probably never contemplated when the plans were drawn, and therefore for whose proper support no adequate provision has been made.

Unless special means are adopted for carrying the vertical load of a water tank, or the equally heavy wind loads which are induced by the erection of the huge advertising signs that are becoming so common, the building and the lives of the people within are exposed to dangers whose magnitude can only be appreciated when disaster ensues.

One of the most shocking accidents of this kind occurred in June in the city of Montreal, when the supports of a tank on the top of a building collapsed, and the heavy structure with its load of water went down through the rear of the building, wrecking everything in its way to the very basement. A score of people lost their lives in this disaster, and a fire which originated in the wrecked stereotyping plant served to swell the death list.

The placing of a water tank, weighing, with its contents, anywhere from 10 to 50 tons or even more, upon the top of a building, is an extremely serious undertaking, one which certainly calls for the oversight of an architect or the consulting engineer. The usual method of support adopted involves the concentration of this load upon a few points, frequently not over four; and too often this concentrated load will be allowed to bear directly upon the top of a brick wall that was never intended to serve as anything more than an inclosing or a partition wall of the building, and therefore was not designed even to carry more than the distributed load of the ordinary roof construction. Hence, it must frequently happen that the brickwork is subjected to crushing stresses much higher than safe practice would allow, and undesirable buckling stresses also are brought to bear upon the expanse of wall below.

Furthermore, the water tank, because of its lofty position, and the considerable area exposed to the wind, must, in stormy weather, be subjected to overturning forces, which not only greatly increase the existing vertical loads on the leeward side, but also must set up transverse stresses upon the building.

It is probable that these facts are taken into consideration by all the reputable firms that are engaged in the construction and erection of such tanks, and that the proper examination and strengthening of the building is made at the time of their erection; but it may well happen when tanks are erected upon old and comparatively unprofitable buildings, in the improvement of which strict economy has to be practised, that the additional loads are imposed without a proper examination of the carrying strength of the walls or columns.

A similar investigation should be made whenever display signs of great magnitude are erected above the roof line, where they are exposed to the full sweep of the winds. That this is not always done, is proved by the number of signs that are torn down when heavy storms pass over a city. Few people outside of those whose duty it is to have expert knowledge of the subject, understand how quickly a heavy wind blowing on an exposed surface will develop tons of pressure. Not only should the surface itself be thoroughly braced to resist distortion, but care must be taken to distribute the pressure through the supporting posts and braces, so that it will be spread over as large an area of the roof as is practicable. In the largest city signs, this is a task calling for the expert knowledge of the architectural engineer. For an excellent example of how well this work can be done, we refer to the illustrated article on another page of this issue, showing the triangular bracing at the back of the huge electric sign which has recently been erected upon the Hotel Normandie in this city. If a layman were asked to make a guess at the total pressure which could be developed against the face of this sign during a gale of wind, he might hazard an estimate of some 15 or 20 tons; and he would be filled with no little astonishment to learn that when the full impact of such a summer tornado as swept over this city three weeks ago, falls upon the structure, the pressure may mount up to nearly 1,000 tons—as the figures will show. The exposed area measures 90 feet in width by 60 feet in height. The maximum wind pressure per square foot adopted by bridge engineers in calculating the wind stresses is from 30 to 40 pounds per square foot. If we adopt 35 pounds, we find that when a summer tornado sweeps over the North River and strikes the sign with its maximum intensity, the load may temporarily reach 945 tons. Hence the heavy system of ties and braces which is massed to the rear of the sign.

UNIFORMITY IN THE ELECTRIFICATION OF RAILROADS.

A CONVINCING plea for uniformity in the electrification of railroads was made by George Westinghouse at the recent meeting of the American Society of Mechanical Engineers. This is a subject which, in view of the great inconvenience and enormous expense resulting from the adoption of different gages on the early steam railroads, must be regarded as of the greatest importance. It is to-day possible to discuss this problem on grounds of fact and certainty; for large sums have already been spent in the electrification of steam railroads in England, continental Europe, and America, and a fund of information of inestimable value is available as a guide in the selection of a universal system of electrical equipment. Unfortunately, the tendency seems to be rather to diversity than unity; since different types of third-rail construction have been adopted, even for the several continuous current systems in and about New York city, which renders interchange of cars or locomotives difficult or impossible.

The length and detail of this paper prevent its publication in these columns, but it will be found in full in the current issue of the SUPPLEMENT, and we direct attention to the article as one of the most valuable that has appeared on this all-important subject.

The controlling factor in the cost of electrification in nearly all cases is not the locomotive itself, but the system for transmitting power from the power house to the locomotive. Admitting that electric energy can be most economically transmitted by high-tension, alternating current, a comparison is made of the elements which must be included, or rather which must intervene, between the alternating-current generator at the power house and the locomotive on the track, for the two systems of transmission which are at present most generally in use.

The elements in this transmission in the case of the direct-current system locomotive consist of: *A*, Raising transformers in groups of three; *B*, A transmission line of three wires, sub-stations, which require attendance, containing *C*, Transformers in groups of three, and *D*, Rotary converters for receiving the alternating current and delivering direct current; *E*, A third-rail contact conductor, which for heavy work must often be supplemented by copper feeders; *F*, The track return circuit, which must be provided with heavy bonds, and in certain cases supplemented by feeders and so-called negative boosters.

The elements involved in the single-phase system are: *A*, A raising transformer; *B*, A transmission line of two wires and sub-stations widely spaced, each containing, *C*, A lowering transformer, which supplies *D*, A single trolley wire; E, A track return, usually requiring nothing but inexpensive bonding.

In addition to the marked simplicity of the single-phase as compared with the direct-current method, as illustrated by this comparison, it should be borne in mind that the single-phase motor has a facility of voltage control which gives an efficient means of speed adjustment, and is in this particular superior to the direct-current system as used on the New York Central Railroad, and to the three-phase system as used so extensively in Italy.

In the final summing up of the requisites of a universal electric system, Mr. Westinghouse mentions the following elements as of prime importance:

First, the electric locomotive should be capable of performing the same kinds of service which the steam locomotive now performs.

Second, the electric locomotive should be capable of exceeding the steam locomotive in its power capacity.

Third, the electric system should adapt itself to requirements beyond the ordinary limitations of the steam locomotive in small as well as in large things, that is to say, it should be adapted for use on branch lines.

Fourth, a universal electric system requires that power should be transmitted economically over long distances and supplied to the contact conductor.

Fifth, the contact conductor in an ideal system should be economical to construct, both for the heaviest locomotives where the traffic is dense, and for light service on branch lines. It should impose minimum inconvenience to track maintenance; should give minimum probability of disarrangement in case of derailment, or in case of snow and sleet; and should in general be so placed and constructed as to give a maximum assurance of continuity of service.

ENGINEERING.

The dismantling of the government cement mill at Roosevelt, Arizona, which was built because of the high cost of transporting cement to the site of the Roosevelt dam, marks the end of one of the most successful undertakings of its kind. During its five years of operation, the mill has turned out 330,000 barrels of cement, the bulk of which went into the dam, and the remainder into the flumes, canal and power house. It is estimated that the mill has effected a net saving of $650,000.

The total number of military airships completed in Europe and this country is at present 27, and nearly as many more are being built. Germany possesses 13 completed airships, France 7, Italy 2, and Belgium, England, Austria, Russia and the United States have 1 military airship each. The smallest is the German "Clouth," of 1,700 cubic meters gas capacity and 22-mile speed. They vary in length from 100 to 450 feet. The largest machines are the "Zeppelins" I, II, and III, which are of from 12,000 to 15,000 cubic meters capacity.

Hitherto the electric zone of the New Haven Railroad between New York and Stamford has been operated entirely by electric locomotives; but recently the company has established a multiple-unit train service, the first installation of the equipment consisting of four motor cars and six trailers. The cars, which are 70 feet long, are built entirely of steel and each can seat 76 passengers. The motor cars weigh 86½ tons, and each will haul two 49½-ton trailers. They are designed to run either on 11,000-volt alternating overhead current or 600-volt third-rail direct current.

Very gratifying is the demonstration which is being made on the Pennsylvania Railroad of the many advantages of steel passenger-car construction. To-day that company has in service or on order nearly 2,000 cars of this type, and it is putting in service as fast as they can be built, steel sleeping and parlor cars, the deliveries being made at the rate of from 50 to 60 a month. The steel car is non-collapsible, the brunt of a collision being borne by a massive central box girder, 24 inches wide by 19 inches deep, which extends throughout the entire length of the coach from coupling to coupling.

The powerful abrading effect of the cinder-laden blast from locomotive smokestacks has been shown at a bridge in Boston, which was built with its lowest members only 15 feet above the tracks, and therefore within a foot or so of the mouth of the smokestacks. Although the steel I-beams of the floor were completely inclosed by thick lead plate, and the webs and flanges were also protected by hollow tile, within ten years' time the blast has eaten through the lower faces of the tiles, and bodily cut out pieces of the lead, whole sections of both the tile and the lead falling to the ground. The destructive effect was much less notable in bridges having three feet additional clearance.

The latest move in the seemingly interminable Subway problem comes in the form of an offer from the Interboro Company to operate the Steinway tunnel between Long Island and Manhattan on a five-cent transfer basis, provided the company is permitted to complete the third tracking of the Second, Third, and Ninth Avenue elevated lines; to extend the Second Avenue line across the Queensboro Bridge with a branch in Queens; and to build two elevated extensions in the Bronx. The Steinway tunnel proposition is attractive; but because of the universal objection to further elevated extensions, it is unlikely that this part of the proposition will be approved by the Public Service Commission.

In a paper recently read before the Institution of Mechanical Engineers, Mr. George Hughes pointed out that the application of compounding to locomotive work is a different problem from that of its application to marine and stationary engines. The reasons for the apparent neglect of compounding in Great Britain are (1) the great variation in torque from starting to full speed; (2) the frequent repetition of this variation; (3) the comparatively good results of the simple engine. The value of compounding largely depends upon reduction of the range of temperatures in the cylinders, and since high piston speeds reduce this range in express locomotives, the author argues that for this type of engine compounding will give but little benefit.

American visitors to France are surprised at the unusually high speed developed on some of the French railroads. As a matter of fact, the French have for several years held the leading position in respect of the speed of their fastest expresses. The schedules of this year's summer service show a further acceleration. Thus, the Northern Railway has put on a new day express from Berlin to Paris, which covers the distance from Paris to St. Quentin (96¼ miles) in 93 minutes, a speed of 62.1 miles an hour; and the 53¾ miles to the Belgian frontier is covered in 51 minutes at a speed of 58½ miles an hour. The Eastern Railway Company has scheduled an afternoon express from Paris to Bâle, which runs the first 104.37 miles in 107 minutes—a speed of 58.5 miles an hour.

ELECTRICITY.

By this time next year all vessels leaving our ports will probably be required to carry wireless telegraph outfits, provided they have fifty or more passengers aboard. A bill to this effect recently passed the Senate and also the House.

At the international telephone and telegraph conference which is to be held in Paris next September, one of the important subjects to be discussed will be that of automatic telephone exchanges. In connection with the conference, the French government has suggested that a public exhibition of automatic systems be held, and has offered free space for such exhibits. Each apparatus must have a capacity of at least one hundred subscribers.

A patent has just been granted on the use of molybdenum for the electrodes of arc lamps. The inventor states that a very brilliant arc may be produced if the electrodes are made of metallic molybdenum and some material which will increase the conductivity of the electrode. Electrodes containing 86 per cent molybdenum and 14 per cent iron have given exceedingly good results, and even a proportion of 10 per cent molybdenum and 90 per cent iron has given an arc that is very white and brilliant.

A plan is on foot to establish a system of wireless telegraph stations in the French colonies of Northern Africa. A number of stations have already been built, or are being constructed, and it is proposed to add several more, all of which will be in mutual communication and capable of communicating with the Eiffel Tower. It has also been suggested that wireless communication be established across the South Atlantic between Port Etienne and a convenient point in South America.

To accelerate the work on the Gatun dam this portion of the Panama canal has been illuminated so that the work of discharging the barges of rock and sand may be continued night and day. The illumination consists of sets of flaming arc lamps, strung between the towers of the three cableways used to handle the material. In addition to this, searchlights are used which throw a beam of light along the cables and over the dock. The illumination is so efficient, that the workmen prefer the night shift to the day shift under the tropical sun.

In connection with the telephone relay invented by Mr. S. G. Brown, which we described in a recent issue of the SCIENTIFIC AMERICAN, it is interesting to note that experiments somewhat similar were conducted some time ago by P. R. Coursey, who described them in a recent number of the London Electrician. He used a fine needle and a cup of mercury with a layer of oil between the mercury and the needle, and found that when the needle point was approached very close to the mercury, so that it was insulated therefrom by a very thin film of oil, a current passed through the film would be highly sensitive to slight fluctuations. The device thus served as a powerful microphone. It was found that glycerine oil produced the best results. It will be recalled that in Mr. Brown's relay, a similar gap is provided with a film of oil separating the two electrodes.

A new form of fireless cooker with electric heater attached has recently been put on the market. This should tend to develop the use of electricity in the kitchen. It is well known that the ordinary kitchen range is exceedingly wasteful of heat, the vast majority passing up the chimney or into the room, while very little is taken up by the food which is to be cooked. In the case of gas or electric cooking, much more of the heat is confined to the food, whereas in the fireless cooker provided with an electric heater, there is practically no opportunity for the heat to escape, and consequently this method of cooking should prove very economical. The new device is very compact and comprises a number of aluminium compartments, one above the other, in which the food may be placed, so that an entire meal may be prepared at once.

In a paper read before the Glasgow section of the British Institute of Electrical Engineers, attention was called to the fact that when two strips of celluloid are drawn through the finger and thumb, both are electrified on each side. This is due not only to the friction, but also to the fact that they are bent by the thumb and finger, so that one side, which is convex, is under tension, while the other side, which is concave, is under compression. The side that is under compression is negatively electrified, and the other positively electrified. This suggested the experiment of attaching a number of celluloid strips in layers on a wooden disk mounted eccentrically on the shaft of a motor. When the motor was operated the strips became strongly electrified, demonstrating that it is possible to accumulate static charges by vibration and rotation. This may account for breakdowns of insulation under conditions which have heretofore appeared quite puzzling.

SCIENCE.

Prof. Willis Milham of Williams College is compiling a textbook of meteorology for colleges, which promises to be more comprehensive than any previous treatise on the subject in English.

For the purpose of making the telephone booth really sound-proof, a German inventor lines it with tin. It seems that the lining is in every way most efficient. The result is that a German publication now advises all architects to either use tin or aluminium in the walls of houses generally to deaden sound.

The Royal Meteorological Society recently held a meeting at Manchester, this being the first meeting of the society outside of London during its sixty years of existence. This innovation was a recognition of the leading part that Manchester, through its university, has taken in the development of meteorology in Great Britain, especially in the investigation of the upper atmosphere.

Symons's Meteorological Magazine reports that a dazzlingly brilliant meteor was seen against a sunlit sky at 7:52 A. M. May 10th, from many points in England. Its head formed an elongated mass of flame of a bluish color—several spectators describe it as kite-shaped—and a stream of red sparks followed it. Mr. W. F. Denning estimates that its height was from 83 to 32 miles, descending along a path of 100 miles, at a velocity of 17 miles a second, and that its radiant point was near the bright star Capella in Auriga. It passed over the county of York or Lincoln to Lancashire.

Claude has employed his method of estimating the rare gases in the atmosphere, in an attempt to determine whether the passage of the earth through the tail of Halley's comet produced any effect upon the quantities of these gases in the atmosphere. The method, which is extremely sensitive, was applied to a current of air of 12,000 cubic feet per hour. Experiments were made on May 17th, 19th, 20th, and 23rd for at least three hours on each day. The results do not indicate any appreciable alteration produced by the comet in the quantity of these inert and difficultly condensible atmospheric gases.

The rains of last November in Jamaica were among the most remarkable ever recorded in any part of the world. Official returns at hand show that the maximum rainfall occurred at mountain stations in the eastern part of the island, viz., 135 inches in 8 days at Silver Hill, with a maximum daily fall of 30.50 inches on the 6th, and 120.87 inches in 16 days at Farm Hill. These figures are comparable with the famous downpours at Cherrapunji, India, where 41 inches have been measured in a day and 114 inches in five days. The Jamaica rains caused disastrous floods and landslides, attended by loss of life and property.

In the Chemiker Zeitung, Max Speter publishes an article on the derivation of the word "gas." He mentions the fact that E. O. v. Lippmann and others think it to be derived from "chaos," while other authorities bring it in connection with the word "ghost." Speter's view is that the word "gas" was coined arbitrarily by Van Helmont, and that we can only surmise what he may have had in mind. The word "gas" was used in Germany as early as 1783, although with a different gender from the one now prevailing (*der* Gas instead of *das* Gas). As further examples of arbitrary word formations, the author mentions the terms "afer" and "ester."

Newspapers report that in the Alpine regions of the Swiss cantons of Vaud and Valais cheese-makers will keep their products for years. They assert that cheese improves with age. At Les Ormonts, in the canton of Vaud, it is customary to make special cheeses for certain family feasts. They are tagged with explanatory labels and eaten several years later, at other feasts, or even at funerals. Often such cheeses are bequeathed from one generation to another as family souvenirs. Recently, at Les Ormonts, in a concealed shelter, there was discovered a cheese dating from 1785. It was as hard as a rock, and had to be cut with a saw. It is reported to have tasted good.

The British Rainfall Organization has just been transferred by its director and former proprietor, Dr. Hugh Robert Mill, to a board of trustees, who will insure the perpetuation of its work and enable it to receive an endowment fund, the nucleus of which has already been subscribed. This organization has been the unique instance of a great meteorological service maintained as an individual and personal enterprise. It was founded in 1860 by J. G. Symons, who thereafter published annually the rainfall records of his corps of volunteer observers, scattered over the British Isles, the number of whom was gradually increased until it is now nearly 5,000. Mr. Symons and his successors also carried on important investigations as to methods of measuring, discussing, and mapping rainfall, and published Symons's Meteorological Magazine as an adjunct to the work. On his death in 1900 Mr. Symons bequeathed the undertaking to Mr. H. Sowerby Wallis, and in 1903 Mr. Wallis retired in favor of Dr. Mill. The latter will continue to direct the work, as chairman of the board of trustees.

A GIANT STEAM EXCAVATOR

BY OUR ENGLISH CORRESPONDENT

A new type of steam crane excavator, especially designed for working in deep cuts, has been evolved by an English inventor, Mr. A. R. Grossmith, whose novel rotary conveyor was recently described in the SCIENTIFIC AMERICAN. This new apparatus possesses several interesting and ingenious features, its pre-eminent point being that it expedites and facilitates excavation in a deep cut by enabling the whole face of the bank, fifty or sixty feet deep, being dealt with in one operation. The usual practice when working in deep cuts is to cut galleries at different levels on which to work the ordinary steam excavators. In a 60-foot cut this may involve the use of three machines. With the Grossmith, the excavator is established at the bottom of the cut, and it will work on the whole face without any fear of cave-ins, the face of the embankment being cut away uniformly and in such a manner that there is no overhang at the top.

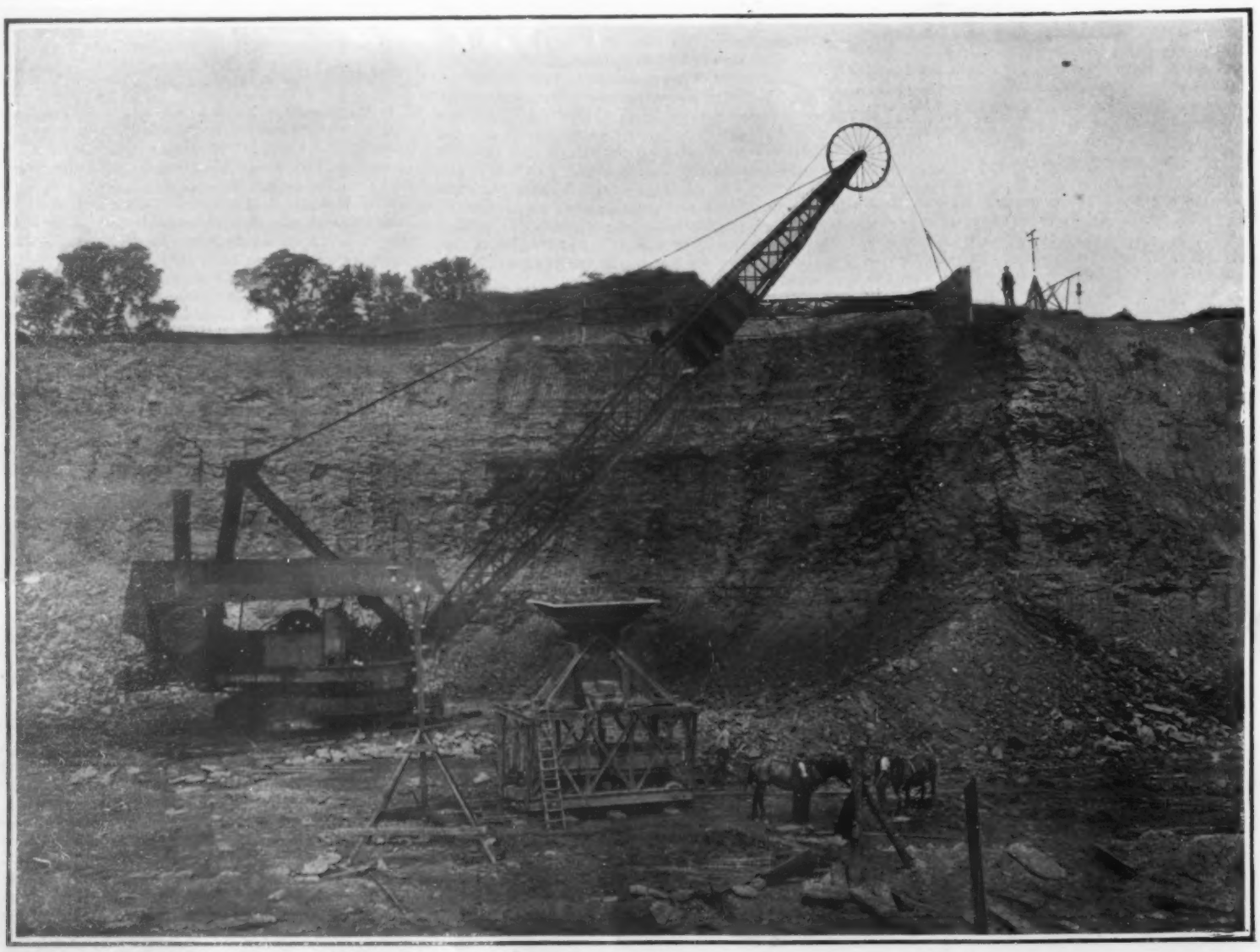
The first one was constructed by the Darlaston engineering firm of Rubery Owen & Co., and it is believed to be the largest excavator of the crane type that has ever been built. It was designed to meet the peculiar conditions prevailing at the brick fields of its owners, J. B. Forder & Sons, Ltd., at Pillinge. The cut is 60 feet in depth with a mean width of 150 feet. The great difficulty confronting the brickmakers here was to secure an even mixture of the top and bottom clays to insure a uniform result in the bricks. At the same time it was necessary to secure a plant wherein the danger of the top of the bank slipping was reduced to the minimum. For some years past the brickmakers have endeavored to secure some means of working the whole face of the cut in one operation, but without success, until the construction of the Grossmith machine.

View of giant excavator and small navvy, showing comparison both of dimensions and cutting of face of excavation.

A general idea of the lines of the excavator may be gathered from the accompanying illustrations, which show it cutting and dumping respectively. Being of the crane type, it is capable of digging in a circle. The jib is 80 feet in length, inclined at an angle of 45 degrees, and the lifting effort at this radius is 12 tons. The maximum radius, however, with the bucket arm or muck pole fully extended is 90 feet. The jib and bucket arm are of lattice girder construction, and the jib is stayed by two wire ropes. The base of the jib is set at one end of a heavy engine frame comprising two parallel rolled steel joists, and is counterweighted at the opposite end by the engine boiler. The cantilever for the jib stays is composed of two pairs of stout joists meeting at the top so as to form a triangle with the main frame.

The engine frame has the long wheel base of 17½ feet, while the gage of the track is 12½ feet. The bucket arm is pivoted at an unusual height and is made telescopic, being controlled by wire ropes from a self-controlled engine on the main frame. When working at the maximum depth of cut this telescopic arm is fully ex-

(*Continued on page 37.*)



THE NEW GIANT EXCAVATOR AT WORK, THE BUCKET TEETH-MARKS SHOWING IN THE CUTTINGS RIGHT TO THE TOP.

THE TWO HIGHEST MASONRY BRIDGES IN THE WORLD

BY F. HONORÉ

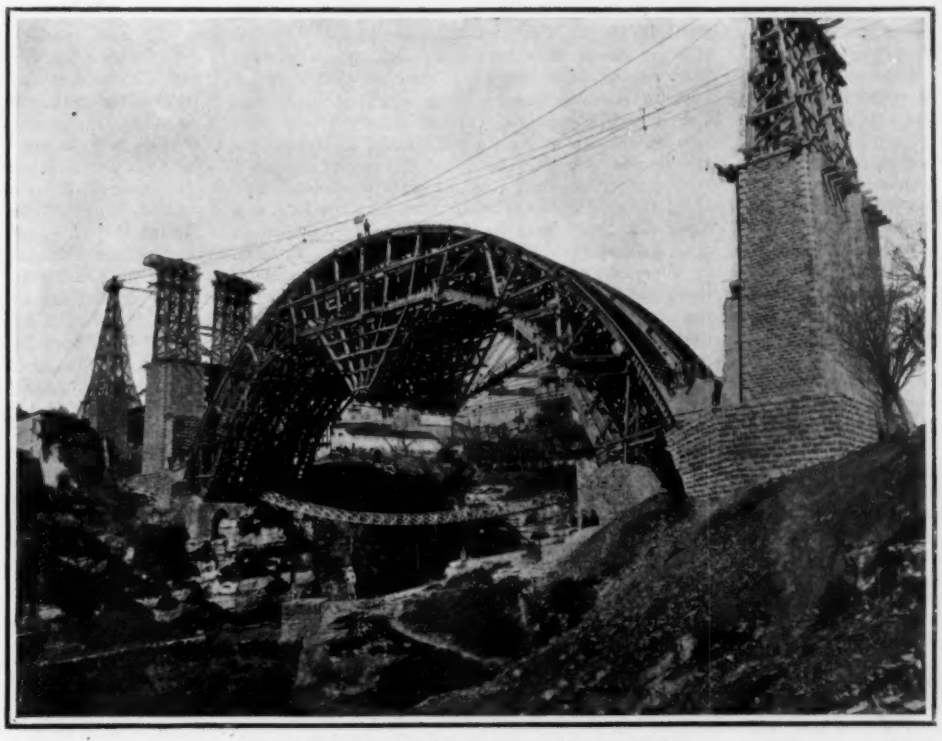
A masonry bridge of exceptionally bold construction and of far greater height than any other in existence was recently completed at Constantine in Algeria. The city of Constantine is built on a rocky plateau which is almost surrounded, and is separated from the railway station, by the deep, precipitous and very picturesque gorge of the Rhumel River. The new viaduct which crosses the valley has a total length of 1,475 feet, and comprises 27 arches of very unequal dimensions. The largest of these arches has a span of 230 feet, and crosses the gorge about 330 feet above the bed of the river.

The construction of the false work involved special difficulties because the banks of the stream at this point are quite inaccessible, so that it was impossible to use any intermediate support between the cliffs. Hence it was necessary to extend the falsework, section by section, from each cliff, and to sustain it by cables attached to masonry anchorages. An auxiliary scaffolding was employed in erecting the middle section, and communication between the two cliffs was maintained by means of a flexible foot-bridge.

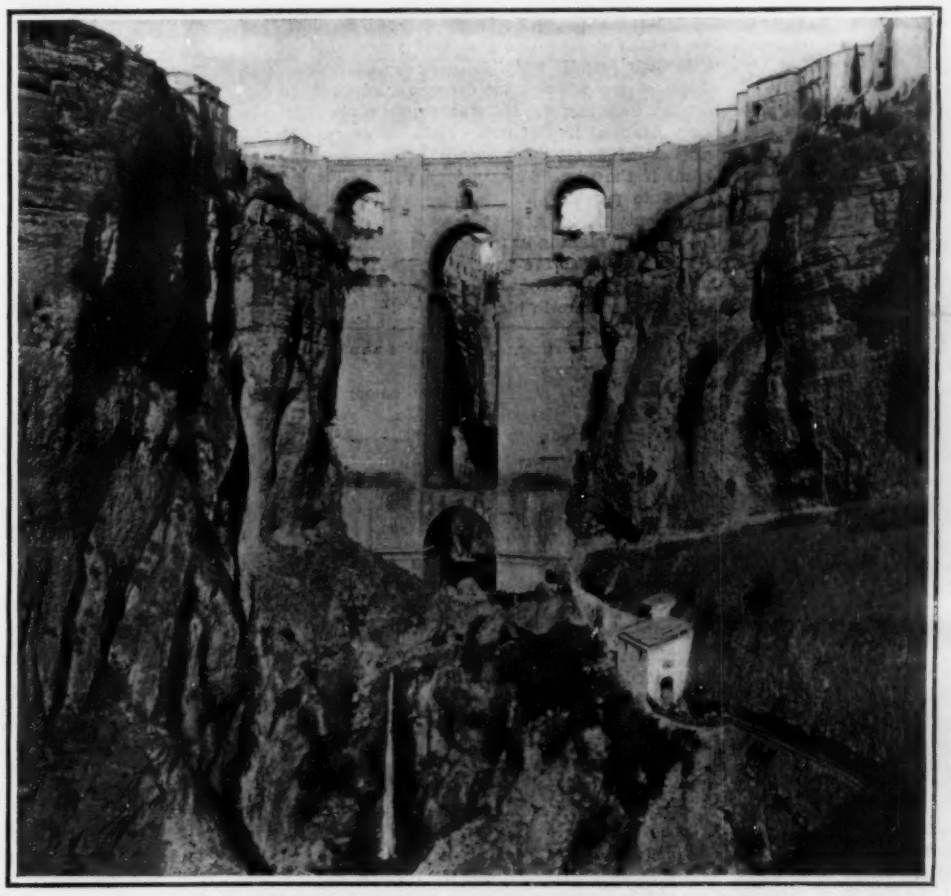
The type of this viaduct was devised by Séjourné, who first employed it in the construction of the Luxemburg Bridge, a few years ago. Each span is formed of two parallel arches, each 13 feet deep, separated by an interval of 13 feet and connected, at the crown, by a plate of reinforced concrete.

The second highest masonry bridge in existence is the bridge at Solis, in the Swiss canton of Grisons. This viaduct is nearly 500 feet long, and the largest of its twelve stone arches has a span of 138 feet and crosses the gorge of the Albula, 292 feet above the stream.

The third highest is the bridge which crosses the river Lagus at Ronda, in the Spanish province of Andalusia. This bridge was built in the eighteenth century, and the progress which has since been made in engineering is strikingly illustrated by comparing its construction with that of the Constantine Bridge. At Ronda, also, it was required to connect two cliffs, separated by an interval of about 230 feet. The height of the cliffs is about 274 feet, not 460 feet, as is erroneously stated in a classical work. The engineers of the eighteenth century doubtless deemed it impossible to span the chasm with a single arch. They solved the problem by erecting huge piles of masonry on the sides of the ravine, and constructing a bridge of three arches. This construction is possibly as strong as the single Séjourné arch of the Constantine Bridge, but it is less elegant and far more costly.



The Constantine Bridge in course of construction.



The bridge at Ronda, Spain, built in the eighteenth century.

THE TWO HIGHEST MASONRY BRIDGES IN THE WORLD.

Since the War Department has been making improvements in the size of the pack as carried by the infantry soldier, decreasing the weight, installing aluminium utensils, and adding new style of clothing, another improvement will be shortly inaugurated which it is thought will be of great benefit. This latest improvement is teaching every soldier to be his own shoemaker. The new type of shoe which is to form part of the equipment and apparel of the foot soldier will obviate some of the difficulties which arise from breaking in of new shoes while the men are on a campaign. The new shoe is so arranged that it may be resoled and reheeled by the soldier himself. The shoe has four soles. The outer and middle soles are formed of a compressed and specially treated leather. The heels are also interchangeable, and are constructed of two stout layers of specially treated leather. Both heels and soles may not only be detached and renewed when worn out, but the heels may be shifted from one shoe to the other. That this is of benefit is evidenced by the fact that a great many people wear their heels down unevenly.

By a special process the uppers of the shoes are also treated, which makes them soft and flexible, at the same time making them waterproof. No amount of soaking in water makes them lose their flexibility upon subsequent drying, nor even if dried before a fire. The weight of the new shoe is not very great, and a soldier may carry a number of extra soles and heels. Another feature of the shoe lies in the fact that it may be resoled a number of times without injury to it, as no stitching is required. All that is necessary for resoling is a small screw driver and two small screws. The soldier removes the old sole and heel and slips on the new ones, the whole proceeding taking about two minutes. In this manner he has the equivalent of a new pair of shoes, with the added advantage of retaining the comfort of an old pair. Old soldiers will appreciate this fact, and recall the many pains and aches endured from going on a march with brand new shoes.

A German patent has been issued for a new sizing material, which is prepared in the form of powder, is suitable for the use of artists, bookbinders and wall-paper manufacturers, and adheres firmly to glass and metal. It is made by mixing 50 parts by weight of gum arabic, 5 parts of wheat flour, 2 parts of gum tragacanth, 25 parts of dextrin, 15 parts of sugar, and 3 parts of magnesium sulphate. All of the ingredients should be finely pulverized before they are mixed. The sizing materials hitherto employed are not permanent, adhere poorly to many substances and do not take ink satisfactorily. The new mixture is perfectly permanent and can be easily transported and quickly prepared for use by dissolving it in cold water. The addition of magnesium sulphate causes it to adhere well to smooth surfaces, owing to the firmly adherent crystalline fellicle which is formed by the slow evaporation of the solution, and also greatly increases the power of absorbing emulsified oils. The wheat flour gives the coating of size a matt surface, which takes ink very well.

A test of nickel-steel riveted joints made from four different kinds of commercial nickel steel showed the strength of nickel steel to be about two to two and a quarter times as high as that of joints riveted with wrought iron or mild steel rivets. The advantage thus gained more than counteracts increased cost.

The Wreck of the "Deutschland."

BY CARL DIENSTBACH.

Every one must feel a pang of regret that the first air liner, "Deutschland," should have been wrecked in a storm. The fine maiden voyage of this vessel had not only driven home the charm of atmospheric travel more than ever before, but it offered a chance for a sky trip to anyone for a comparatively moderate price. Mr. Hawley, of the Aero Club of America, once figured that an ordinary balloon ascension always cost him $132; namely, $32 for gas, $35 for a pilot, $15 for helpers, $6 minor expenses, $10 expressage, $10 for meals, $5 after landing, $3 for wagon, $3 for "tips," $10 for pasting ripping panel. Hence the fares of the "Deutschland" ranging from $25 to $50 were very moderate. The "Deutschland" trip was the first instance of modern wholesale passenger carrying in the air. Because of her capacity she could offer greater luxury and comfort at a comparatively low figure. The "Deutschland's" hugeness added to the charms of aerial motoring all the peace and comfort of a spherical balloon. At last year's Gordon Bennett balloon race in Zurich, a medium-sized Parseval airship was inflated in the open, with the "sphericals," and circled in the air while they got under way. The few invited passengers on board were enthusiastic over the evolution, but complained that the violent vibration, their closeness and consequent exposure to the grime and noise of machinery, had marred their pleasure. In the "Deutschland" the large scale and "decentralization of the load" insured perfect comfort and especially absence of vibration in the passenger cabin.

This fine ship was lost through over-confidence, and a certain amount of negligence, a humanly excusable consequence of the enthusiasm engendered by the first success. Contrary to newspaper comment, this disaster had hardly anything in common with previous fatal accidents to Zeppelin ships. In one way it is quite unique and "paradoxical." It proves that the Zeppelin rigid construction is safer than the non-rigid in certain emergency landings. What would have happened to a Parseval under the same conditions? The car, with its concentrated heavy weight, would surely have crashed through the trees right to the ground. The envelope would have been torn into shreds and complete destruction and loss of life would have resulted. The "Deutschland," with its immense rigid length and the cars directly under the hull, was caught in the trees like a cushion. As far as personal safety is concerned a rigid airship seems to behave rather like an aeroplane. The craft breaks, but the passenger usually escapes.

All the real blame may be placed at the door of the meteorological service. It seems hard to believe that nothing was known beforehand of a severe storm that was to sweep the country within the brief space of two hours. There is also no excuse for the failure to provide wireless apparatus on the ship to warn the officers of this peril. A wireless receiver adds practically no weight to the equipment of any aircraft. It is available to the smallest spherical or aeroplane.

Disasters at sea were greatly reduced when early in the nineteenth century the "laws of storms" were at last comprehended. How much more important should it be to an aircraft, to know exactly the position and the shifting or a storm's center! To cap this, there seems to have been a faulty, near-sighted navigator on board the "Deutschland.". Precious hours were absolutely wasted while trying to stem the tide of the wind—considering the fact that the craft entered the struggle under a heavy handicap. This appears like madness. When the "Zeppelin II." was lost at Weilburg, the Zeppelin company rightly criticised the military officers for some obvious mistakes they had made. Now the company has laid itself open to criticism. Its experience with rigid airships naturally excelled that of the military authorities. New experience had to be paid for dearly. It has come to light that at least those in charge on the fatal trip lacked indispensable knowledge.

There was one thing fundamentally wrong with this trip, which is most obvious, but has been ignored: From the strictly nautical point of view the "Deutschland" could lift its full complement of twenty passengers only on exceptional occasions.

To make the ship pay, every ounce of available lift was, of course, pressed into service. There is no objection to this whatever, especially for short trips. (It has been done many times, even the "small" Z. I. once carried twenty-eight two hours long) *when the weather can be trusted.* But there is the fundamental difficulty with air navigation that each air craft is a "seagoing" craft. What would have been the history of steam navigation if Fulton's "Clermont" and its early progeny had been tried out at sea, near rocky shores in stormy weather? If the stormy development of the "Deutschland's" trip had been half way anticipated, the twenty passengers would have been reduced to five or six, the crew to nine, the fuel supply increased and the gas supply decreased. The crisis for the "Deutschland" came when with fuel exhausted it was carried helplessly to high altitudes by an ascending rush in the hurricane. The gas was lost by expansion, and the badly deflated overloaded rain-soaked ship would have dropped like a stone, if it had been a flabby, "pear shape" spherical, without ballast, in place of a long rigid parachuting structure. It should not be forgotten that in such a gale, Capt. von Siegsfeld was killed in a spherical balloon while landing in Holland.

With the "Deutschland" prepared as stated, it could, with running motors, have resisted the upward gust. The change of altitude would not have weakened its support because the gas would have had space to expand inside the hull, instead of escaping.

What should have been done with the unprepared ship was to have reached a place of shelter in the shortest possible time by going with the storm, but, like a skilled mariner, working steadily away from the center. As in marine navigation, all regard for the "course" must be abandoned in cases of danger.

Newspaper accounts that the craft was "unmanageable" (nobody knows what that word stands for), and especially that the pilot "did not dare to turn it around for fear of capsizing," are not only disproved by later Berlin reports of the passengers agreeing on the ship's excellent work against the elements until the power gave out, but the statement about turning contradicts itself. The course seems to have been fairly well maintained despite the storm. An intentional turn could have been made in so wide a circle that it would be unnoticeable. There would be some racking and pitching in violent gusts, but the resistance of these is exactly the strong point of these monster Zeppelins. They have great weight and inertia and little surface in proportion.

Inertia resists the gusts, and surface, the *whole* surface, not merely the projected area, according to the modern frictional theory, helps them. Consequently the very smallest and lightest airships, the notorious American show dirigibles, are the most unstable of all. The stability of the Zeppelin in a wind that played havoc with sphericals at Frankfort and made it hard to keep one's hat on, must have been seen as the writer saw it, to be appreciated. It was not for nothing that a mere attendant of the aeronautical exposition answered the incredulous question of the writer: Will the Zeppelin ascend on such a day? "The Zeppelin does not care for the weather; the others (at the exposition) do." And there was also a reason why the French during the past two years did nothing with their small dirigibles. Fortunately, the Zeppelin movement is now too deeply rooted in stolid discerning Germany to suffer too much even by the heavy financial loss of this wreck. If over-confidence was destroyed, all the better.

And if the new "Deutschland" will be made large enough to provide space for the gas to expand even with twenty passengers—only an increase in first cost but none in running expenses, the result will be still better. As it was the passengers owed their lives to that increase in size which rendered it possible to carry three motors in place of two.

The Government's Money Laundry.

BY THOMAS D. GANNAWY.

Very few people realize the vast amount of money that is spent by the government each year for the manufacture of our paper currency and the maintenance of its circulation. It actually costs "Uncle Sam" $13.50 per thousand notes (regardless of denominations) to manufacture and put them into circulation. This is equal to an annual interest of almost 1¼ per cent on the $1 notes, which have an average life of only fourteen months. The life of small notes is very much shorter than that of the larger denominations, because of the greater amount of handling which they receive, therefore, the greater part of the expense of our paper currency circulation is incurred with the smaller denominations. This is better understood when we learn that the $1, $2 and $5 notes—excluding national bank currency—compose about 43¾ per cent of the number of notes in circulation. The larger denominations are fit for circulation much longer after they are first issued than the smaller ones, hence do not have to be redeemed so soon thereafter.

A very large portion of the notes which come back to the Treasury Department for redemption are not worn out, but are merely soiled from rough usage.

As a result of the clamor for economy in public expenditures, and also for clean paper currency, the Director of the Bureau of Engraving and Printing, Mr. Joseph E. Ralph, conceived the idea of putting these soiled notes through a laundering process and then back into circulation. The more he studied the scheme the more feasible it appeared to him. He submitted his plan to the Secretary of the Treasury, and he (the Secretary) appointed a committee composed of Mr. C. S. Pearce of the Treasurer's office, chairman; Mr. Burgess Smith of the Bureau of Engraving and Printing, chemist; Mr. George Leet of the Secretary's office; Mr. C. C. Pusey, Assistant Treasurer at Baltimore, and Mr. L. R. Acton, a paper expert of Washington.

These men have been experimenting with the laundering process for about seven months, and, as a result of these experiments, have proved beyond a reasonable doubt the feasibility of the scheme.

The process of washing the money is very simple, being almost identical to that used by the steam laundries all over the country. The chairman of the committee says: "The scheme of laundering paper money is here to stay, but the exact method of washing it has not yet been decided upon." The committee are experimenting with two or three styles of tubs. One of the most feasible plans is to put the notes into a wire contrivance, which holds them in such manner as to prevent any friction whatever, and also prevents them from piling together. This contrivance consists of a number of wire trays with a single layer of notes in each, and then stacked together and placed inside of a cylindrical tub filled with suds made with a soap especially prepared for this work by Mr. Burgess Smith, chemist, who has charge of the practical part of it. The soap is composed principally of potash and some high grade oils. Mr. Smith is now trying to manufacture a soap which will cleanse the money and at the same time bleach it.

After the trays of money have been placed in the suds, which have been heated to a temperature of 130 deg. to 140 deg. F., the tub is closed and started to revolving. A greater temperature than 140 deg. F. has proved to be injurious to the money. This process is kept going for ten to fifteen minutes, during which time the dirt has been removed from the notes. They are then taken out and rinsed the same way in clear water for about five minutes to remove all the suds. Next it is put into a germicide bath of the nature of formaldehyde, thereby killing all germs which may be lurking around on it. It is taken from this and bleached and partially dried. The next step is to put it through the sizing tub, or vat as it may be called. This vat contains a 10 per cent solution of glue with a little alum in it. There are a number of small endless belts, which pass over rollers at the top of either end of the vat and under one in the solution. The money is fed in between these belts at one end of the vat, and they carry it down through the solution and drop it out at the other end. It is then taken to the ironing machine.

Here it is placed in stacks containing about forty notes each, with a piece of Fuller (or press) board separating the notes from each other. This Fuller board is a thin flexible substance, resembling a thin piece of sole leather. These stacks are taken one at a time and fed through between two heavy steel rollers, which are held together with a 30-ton pressure. Each stack of notes is put through two of these machines, which completes the ironing and gives them a glossy, new appearance.

The laundry is now washed and ironed, and the only thing left to be done is to place it in the drying room, for the purpose of getting rid of every particle of moisture that it may contain. It pays to launder money for the same reason that it pays to have your linen laundered instead of throwing it away and buying a new supply.

The yellow ink used on the gold certificates is of such a character that the potash dissolves it, and it is washed out, hence they cannot yet be laundered. So it is with the signatures of the bank officers on the national bank notes. The committee hope eventually to overcome this difficulty. As it is at present, they can only launder silver certificates and Treasury notes, but these compose a very large percentage of our paper money.

In my calculations I shall exclude national bank notes, as they are in a class of paper currency by themselves, and for the reason stated cannot yet be laundered. During the year 1909, there were 187,784,000 $1, $2 and $5 notes issued, and in the same period of time there were 177,412,809 notes of the same denominations destroyed. At the close of the year 1909 there were 222,365,692 notes of these three denominations still in circulation. The cost to the government for manufacturing and issuing these 187,784,000 notes was $2,535,084. The cost of destroying the 177,412,809 notes was $390,308.18, making a grand total of $2,925,392.18 for maintaining the circulation of notes of only three denominations for one year.

It is estimated that it will not cost more than one-tenth of one cent per note to launder them. It is claimed that laundering the notes will add at least eight months or 56 per cent to the life of them, thereby diminishing the annual redemptions by 56 per cent. The redeeming and issuing of the 177,412,809 notes in 1909 cost the government $2,787,155.23. With the new process 56 per cent of this, or $1,560,806.93 less $298,053.52, the cost of laundering and reissuing of the 56 per cent of the redemptions for 1909, would be saved. This would leave a net saving of $1,262,753.41 in one year on the circulation of $1, $2, and $5 notes only (national bank notes excluded).

RULES GOVERNING THE COMPETITION FOR THE $15,000 PRIZE OFFERED BY MR. EDWIN GOULD.

1. A prize of $15,000 has been offered by Mr. Edwin Gould for the most perfect and practicable heavier-than-air flying machine, designed and demonstrated in this country, and equipped with two or more complete power plants (separate motors and propellers), so connected that any power plant may be operated independently, or that they may be used together.

CONDITIONS OF ENTRY.

2. Competitors for the prize must file with the Contest Committee complete drawings and specifications of their machines, in which the arrangement of the engines and propellers is clearly shown, with the mechanism for throwing into or out of gear one or all of the engines and propellers. Such entry should be addressed to the Contest Committee of the GOULD-SCIENTIFIC AMERICAN Prize, 361 Broadway, New York city. Each contestant, in formally entering his machine, must specify its type (monoplane, biplane, helicopter, etc.), give its principal dimensions, the number and sizes of its motors and propellers, its horsepower, fuel-carrying capacity, and the nature of its steering and controlling devices.

3. Entries must be received at the office of the SCIENTIFIC AMERICAN on or before June 1st, 1911. Contests will take place July 4th, 1911, and following days. At least two machines must be entered in the contest or the prize will not be awarded.

CONTEST COMMITTEE.

4. The committee will consist of a representative of the SCIENTIFIC AMERICAN, a representative of the Aero Club of America, and the representative of some technical institute. This committee shall pass upon the practicability and efficiency of all the machines entered in competition, and they shall also act as judges in determining which machine has made the best flights and complied with the tests upon which the winning of the prize is conditional. The decision of this committee shall be final.

CONDITIONS OF THE TEST.

5. Before making a flight each contestant or his agent must prove to the satisfaction of the Contest Committee that he is able to drive each engine and propeller independently of the other or others, and that he is able to couple up all engines and propellers and drive them in unison. No machine will be allowed to compete unless it can fulfill these requirements to the satisfaction of the Contest Committee. The prize shall not be awarded unless the competitor can demonstrate that he is able to drive his machine in a continuous flight, over a designated course; and for a period of at least one hour he must run with one of his power plants disconnected; also he must drive his engines during said flight alternately and together. Recording tachometers attached to the motors can probably be used to prove such performance.

In the judging of the performances of the various machines, the questions of stability, ease of control, and safety will also be taken into consideration by the judges. The machine best fulfilling these conditions shall be awarded the prize.

6. All heavier-than-air machines of any type whatever—aeroplanes, helicopters, ornithopters, etc.—shall be entitled to compete for the prize, but all machines carrying a balloon or gas-containing envelope for purposes of support are excluded from the competition.

7. The flights will be made under reasonable conditions of weather. The judges will, at their discretion, order the flights to begin at any time they may see fit, provided they consider the weather conditions sufficiently favorable.

8. No entry fee will be charged, but the contestant must pay for the transportation of his machine to and from the field of trial.

9. The place of holding the trial shall be determined upon by the Contest Committee, and the location of such place of trial shall be announced on or about June 1st, 1911.

Wanted: Information About Dishonest Patent Schemes.

The SCIENTIFIC AMERICAN has always made a practice of exposing the snares and devices of the patent promoter, as well as the fraudulent patent attorney. Although the subject is by no means new to the readers of the SCIENTIFIC AMERICAN, it is one of which all inventors should be thoroughly informed. The Editor of the SCIENTIFIC AMERICAN would like to receive from readers of this journal, letters in which they narrate their personal experiences with dishonest promoters and attorneys. Such letters will be published in due course, and should not only be of interest in themselves, but should serve as a warning, thereby protecting others against such snares.

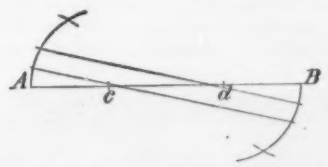
Correspondence.

HOW TO DIVIDE A LINE INTO EQUAL PARTS.

To the Editor of the SCIENTIFIC AMERICAN:

A proportional divider is an instrument well known among the draughtsmen. By means of this device we can divide a line into a number of equal parts. That the same work can be done more quickly and simply by means of an ordinary compass and divider is quite new.

Here below is a way: On both ends of the line which is to be divided draw the curves with *c* and *d* as centers (see figure); *c* and *d* must be equidistant from the ends of the line, and the length of each curve should not exceed the distance from *A* to *c* and from *d* to *B* respectively.



Then lay out equal parts on both curves and draw the lines from the points on the one curve to the points on the other curve. These lines divide the line *A B* into equal parts. If we have two equal parts on each curve, we will get three equal parts of the line; three parts on the curves will give four parts of the line, etc. HERMAN L. SCHIMPFF.

New York City.

"MECHANIPULATE."

To the Editor of the SCIENTIFIC AMERICAN:

If Mr. Wood thinks there is a need in the English language, as stated in the SCIENTIFIC AMERICAN of June 11th, for the word "mechanipulate," he has a right to launch it and see how it will be received. It may meet the sad fate of Mr. Lincoln's word "abolishment," which he proposed as a form preferable to "abolition," or it may speedily become recognized as a member in good standing of the English family. There are at present other good words, broader than "mechanipulate," which Mr. Wood might have used, such as "to operate upon," "to work upon," "to act upon."

On the other hand, I cannot approve of Mr. Wood's use of the verb "to position," although he has the precedent of the Encyclopædia Britannica. The original and proper verb is "to pose." The noun derived from this is "position." To use this latter word as a verb, does not in any way enrich, but only encumbers the English language. There is no sense in which the verb "to position" is used, in which "to pose" will not do just as well or even better. Besides this, the verb "to pose" is rich in its family relations, such as "to appose," or place against; "to compose," or place together, as type; "to depose," or take away from its position; "to dispose," or carefully arrange; "to impose," or place upon; "to superpose," or place above; and many other compounds.

Mr. Wood's sentence would be perfectly accurate and much more pure, if it read: "It is left face up . . . . in position to be most easily *operated upon*; . . . . the mechanism used for the purpose acting with a gentle, uniform motion to *pose* the matrix with accuracy."

It is extremely desirable that the English language should be kept pure, and not encumbered with a lot of useless words, but if there is a real need for a new word, I believe all progressive persons will unite to give the new word a cordial welcome.

RUTER W. SPRINGER.

Fort Schuyler, N. Y.

Scientific American Prizes for Inventors.

The SCIENTIFIC AMERICAN offers $100 in three prizes, to be awarded to the inventor who gives the best account of how he conceived his invention, how he developed it in actual practice, and how he succeeded in selling it. This sum of $100 to be distributed as follows: $50 to the best account, $35 to the second best account, $15 to the third best account.

There is no limitation as to subject matter of the invention. In other words, the invention may be a household utensil, a game, a piece of electrical apparatus, an improvement in railway construction, a metallurgical process, etc. The following conditions, however, must be observed:

1. The invention must be patented.

2. The inventor must have actually sold his patent, and the invention must have been commercially introduced.

3. The account of the inventor's success must not be longer than 800 words.

4. The composition, letter, or article must be typewritten on one side of the paper only.

5. The inventor must sign his offering with a pseudonym, and inclose it in a sealed envelope, upon which the pseudonym is written. A second sealed envelope must be provided, bearing on the outside the pseudonym under which the offering is submitted, and containing the real name and address of the contestant.

6. Contestants must address their offerings to Inventors' Prize Editor, SCIENTIFIC AMERICAN, 361 Broadway, New York city.

7. The contest remains open until August 15th, 1910. Judges will select the essays which, in their opinion, have won the three prizes and give them to the Editor of the SCIENTIFIC AMERICAN, who will thereupon open the sealed envelopes containing the true names of the contestants, and notify the winners of the prizes.

8. The Editor of the SCIENTIFIC AMERICAN has the right to publish the prize winning articles or letters as well as those which may not receive prizes.

9. Unsuccessful letters cannot be returned. It is therefore urged that the contestants preserve copies of their contributions.

Renaming Our Navy.

Ever since the question of having an addition to our navy has been brought up by the Secretary of the Navy—and there seems to be no reason why there should not be an addition—the Navy Department has been put to it to find suitable names for the new vessels.

When the first so-called White Squadron came out, the ships were named after the different States and cities, and the practice has been followed ever since. Nevada and the Territory of Oklahoma are the only States whose names are not already applied to naval vessels, and all except these have their names applied to first-class battleships or large armored cruisers, except the "New York" and "Texas."

The "New York" was brought out in 1893, is now of comparatively small size, and is now being made ready to be sent to Manila for service as flagship of the Asiatic fleet. The "Texas" is a second-class battleship, now of obsolete type, and was brought out in 1892.

When Congress made an appropriation to build new battleships, and the question of naming them came up for consideration, it was proposed to change the name of the "New York," which was christened after the city of that name, to "Manhattan," and to call one of the new battleships by the name of "New York."

Such a change, however, involved many difficulties, which the Navy Department did not see its way clear to meet. The latest suggestion that has been made as to the naming of the new battleships is to rename the old "Texas" and give that name to one of them.

It is appreciated that this would meet the approval of Texans, who, representing the largest State in the Union, would without doubt like to have the name of their State given to one of the new 27,000-ton battleships in place of the present "Texas," which is of only 6,315 tons, and which is now relegated to the receiving ship service.

The renaming of our ships of war has always been a sort of nightmare to the department, for upon the nearing completion of a new ship, the department has been deluged with requests from senators and members to have the ship named for their individual State or city.

It is always the rule that there shall be no two ships of the same name, but there is nothing to prevent the Navy Department from using a name a second time. This is borne out by the fact that within the last ten years the word Maine has been used twice, first on a vessel unhappily destroyed in Havana harbor, and now on a battleship.

Thorium Nitrate in Germany.

In answer to an inquiry, Consul-General Robert P. Skinner, of Hamburg, furnishes the following information concerning the German thorium nitrate industry and the successful efforts in offsetting the trust and reducing the price of the product:

Thorium nitrate is necessary for the manufacture of incandescent gaslight mantles and is produced from monazite sand, found chiefly in Brazil and South Carolina. How this article, now so indispensable, has fallen from $476 per kilo (2.2 pounds) in 1894 to its present level of $3.80, and how the manufacturers of gaslight mantles have broken down the German thorium nitrate trust is an important part of the chemical industry. The whole thorium industry in Germany was absolutely controlled until lately by a syndicate composed of members of three firms. A leading German chemist, in a published report, gives the cost of production as follows:

The cost of the chemicals necessary for the transformation of the monazite sand must be estimated at about $190.40 to $214.10 per ton of sand. The syndicate paid approximately $154.70 per ton of sand containing 5 per cent of thoria oxide. Taking into consideration that the maximum yield is 90 per cent, the cost of production of one kilo (2.2 pounds) of thorium nitrate is about $4.05. The cost of packing and agent's commission would bring the price up to $4.22.

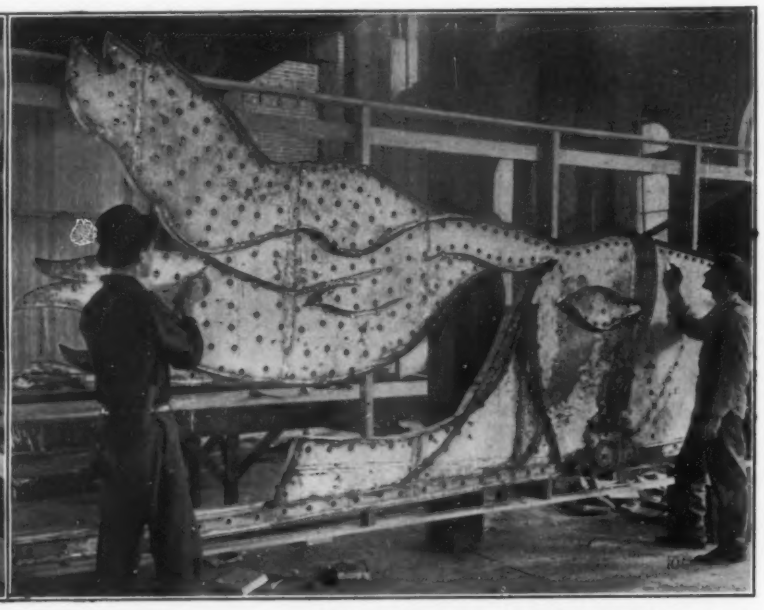
A COLOSSAL ILLUMINATED ADVERTISING DISPLAY

AN ANIMATED SCENE IN WHITE AND COLORED LIGHTS

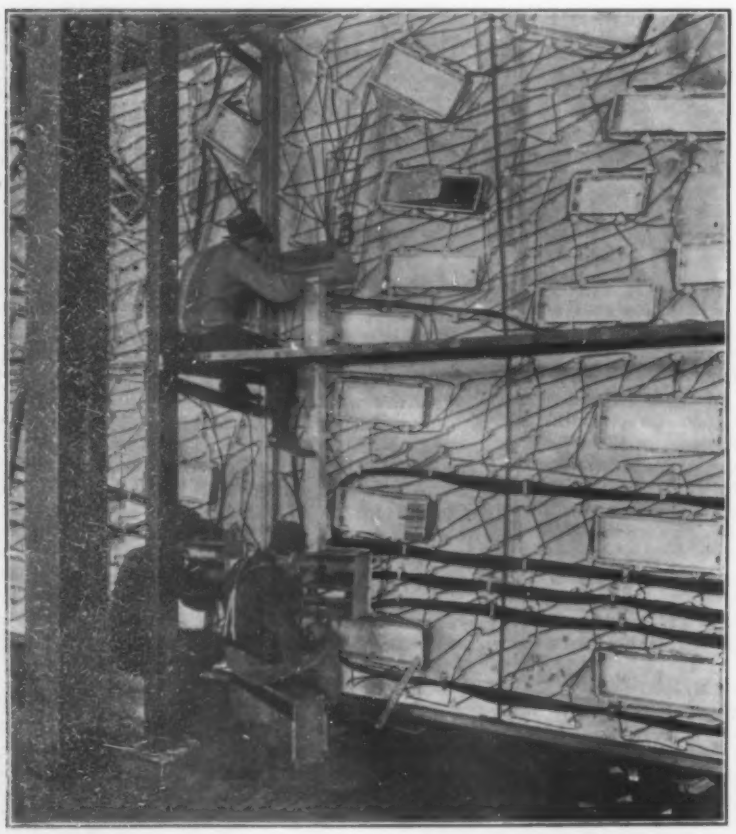
There are so many electric advertising signs in New York city, and so thickly are they clustered about the theater district, that on any night Broadway in this region presents the appearance of being illuminated for some great carnival. In this respect, it surpasses even the large shore resorts. Dominant among these signs is one recently erected on the roof of the Hotel Normandie, overshadowing all others, not only in point of size, but as a spectacular display. It represents a Roman chariot race, done in white and colored lights, in which the horses appear to be speeding around an arena at a mad gallop. The main theme of the display is represented by the words placed at the very top of the sign, namely, "Leaders of the World." One of the chariots, which appears in the immediate foreground, is represented as being well in the lead of the other two. The horses, while galloping at full speed, nevertheless seem to be holding their own without the frantic efforts shown by the other two teams. The spectator is supposed to be moving around the arena with the leading chariot, and for this reason the stadium, the arena wall, and the arena roadway appear to be traveling past the horses at high speed. While the horses are going through all the motions of running, their tails and manes are waving in the breeze, and the drivers' garments are fluttering, and the wheels of the chariot are revolving at such a speed that the spokes are invisible. A cloud of dust rolls up behind the wheels, while at every plunge of the horses the dust is raised by their hoofs. At the extreme right of the display a number of horsemen are represented as clearing the way and announcing the approach of the racers. The entire spectacle is produced in brilliant colors by means of thousands of small lamps, chiefly of two candle-power. Above the arena is a large curtain on which advertisements are displayed of various concerns whose goods mark them as the leaders of the world in their special lines. These announcements are flashed out every few seconds, the entire series occupying a period of about nine or ten minutes, after which the series is repeated.

To attract any attention in this city, where we are so used to dealing with huge proportions, a display must be of gigantic size, otherwise it will pass unnoticed by the busy throng. In this respect the sign is not lacking. As it is intended to display the announcements of the "leaders of the world" it has been made the leader of the world in point of size and number of electric bulbs. It rises to a height of 72 feet above the hotel roof, and is 90 feet wide. Many seven-story structures are not more than 72 feet high. To support so huge a sign in safety under all conditions of weather it was necessary to build a very strong steel structure. One of our illustrations gives a rear view of the sign showing this structure. There are over sixty tons of steel work in it. At first thought, it may seem that undue precautions have been taken, and that the support for the sign is entirely too massive. But we must remember that the sign is not a skeleton structure, but presents an unbroken area of 90 by 60 feet, against which the wind pressure is enormous. It will be recalled that on the afternoon before the opening night, which was June 18th last, New York was visited by a storm of almost cyclonic proportions, which was certainly the most severe storm that has been experienced in this neighborhood for some time. Not the slightest damage was done to the sign by the wind or rain, and immediately after the storm, when night fell, the current was turned on

The arena showing how the dust cloud illusions are produced.



Metal frame of the leading horse's tail. Note the number of lamp sockets required.



Wiring the roadway. Access to the lamps is had through the boxes.

Daylight view of the mammoth advertising sign.

A COLOSSAL ILLUMINATED ADVERTISING DISPLAY.

and the display was begun without any hitch whatever.

To give an idea of the mammoth size of the sign, it may be stated that the length of the tassels hanging from the curtain is considerably more than the height of a man, that the letters which appear in the curtain are four feet high, and that the chariot wheel in the immediate foreground is eight feet in diameter. Altogether there are 20,000 electric bulbs in the sign, which consume about 600 horse-power. Half a million feet of wire is used, and there are 70,000 separate electrical connections. About 2,750 electric switches are employed, and the lamps are flashed at the rate of 2,500 flashes per minute. A train of eight railroad cars was required to haul the sign to this city, after which a large force of expert riggers and electricians worked upon it for three months before it was erected and completed.

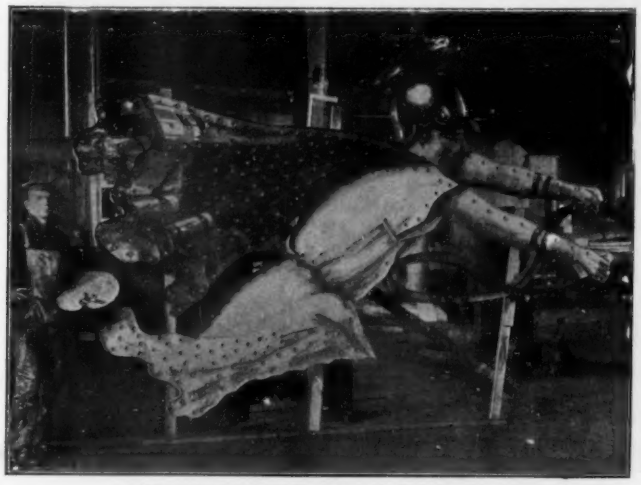
The aim of the sign is not merely to attract the attention of passers-by, but to hold them and impress them with a splendid and magnificent spectacle, and to cause the public to make special excursions to see it. In this respect the sign is a decided success. A most careful study of the motions of a running horse has been made, so as to make the display as realistic as possible. The subject of the illumination, both direct and by reflection, has received every attention, and the general effect produced is such as one would expect to find in a theater rather than on so stupendous a scale out in the open air. As in theatrical displays, the scene is staged. In the foreground is the curtain on which the advertising is flashed. Three feet back is the first chariot. The other chariots and the horsemen occupy a third stage, while the arena wall and stadium occupy the fourth stage. By this means a certain perspective is obtained, which would not be possible were the entire sign produced on a flat surface, as has heretofore been the practice.

The method of producing the running effect is as follows: The bodies of the horses are stationary. The off horse of the first chariot is not provided with any legs, though this is not noticed by the spectator. The reason for crippling the animal to this extent has been to prevent confusion by a multiplicity of legs in motion, for in order to make the scene true to life the horses should not move in unison, but should break step. The legs of the near horse are outlined in eight different positions, and these outlines are successively illuminated so rapidly that the eye fails to detect the change, making the legs appear to be moving as if in running. The mane and tail are provided with series of lamps, which are successively lighted in such a way as to produce luminous waves representing the waving of the hair. One of the photographs shows the horse's tail being fitted with lamp sockets. Even the tassels on the harness of the horses are made to move in this way. Great care has been taken to prevent any mechanical appearance in the running of the horses, and instead of preserving a rhythmic movement, the motion is made to vary slightly, as it would in real life. This is particularly noticeable in the horses of the second chariot, which are supposed to be bending every effort to reach the leaders, and their running, instead of being regular, is varied in order to give the appearance of an occasional break and recover, as of horses near the point of exhaustion. The garments of the leading charioteer flutter and wave in the wind in an irregular fashion. Series of lights extend from the neck of the charioteer down the folds of the toga. The interval between these folds varies, so that, as the lights flash up successively, the garment does not appear to be moving rhythmically, but to be flapping wildly, as it would in an actual race.

One of the cleverest features of the display is the production of the dust whirls under the horses and the chariot wheels. One of our illustrations shows a rear view of the apparatus by which this illusion is produced. Rows of electric lights curved to conform to the dust clouds are placed behind opalescent glass. The lights are successively flashed, causing the eye to follow the luminous waves and thus appear to be watching the actual motion of the dust clouds. The apparent motion of the roadway is similarly produced by means of lights placed behind opalescent glass. The lights are arranged in radial rows, and as these rows are successively illuminated, waves of light appear to be traveling around the roadway in a direction which is the reverse of that which the chariots are pursuing. By having the rows of lights arranged radially, the circular form of the track is brought out. The arena wall behind the leading chariot also appears to travel with the roadway. It is illuminated by means of small bulbs which outline the upper edge and also the wreaths suspended from the wall. The face of the wall, however, is lighted by reflection. Rows of high-power lamps placed behind the charioteer concentrate their light upon one side of the wall, and in this way a high light is produced, which gives the illusion of a convex surface. This method of shading a surface by means of electric light, just as an artist would shade a round surface by means of different tints, is something quite unique in sign work.

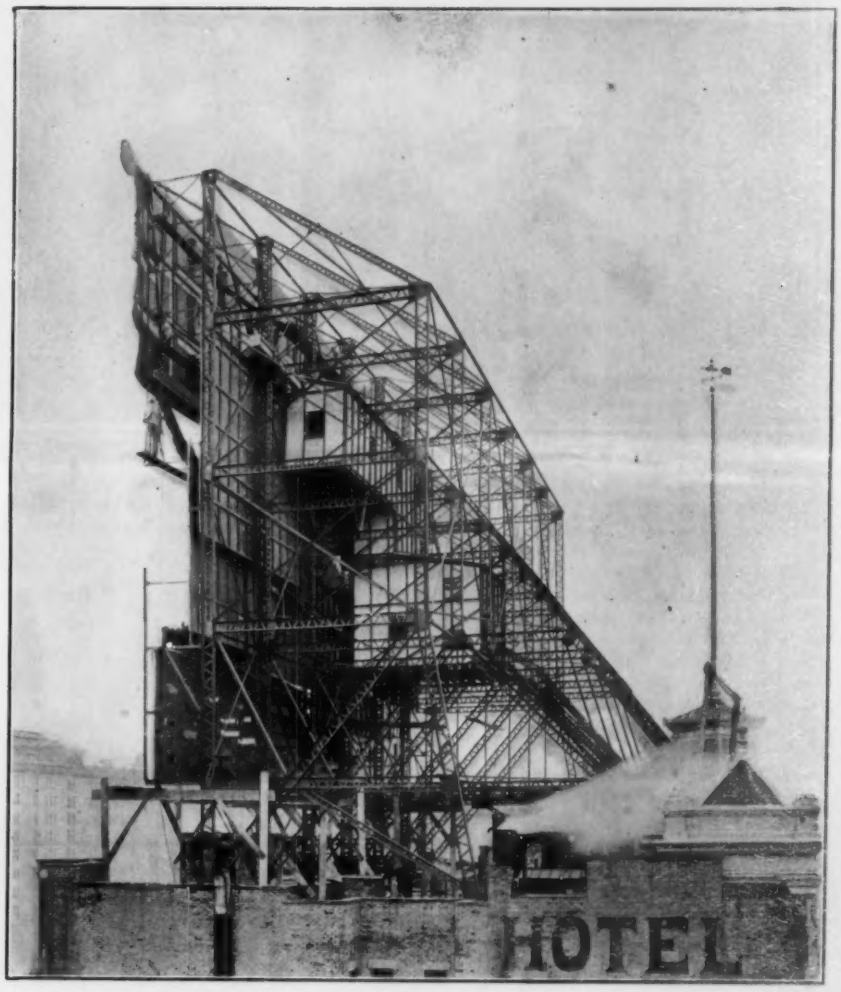
While the mechanism for producing the electric flashes which give the illusion of motion is kept under lock and key, it may be said that each moving part is separately timed so as to produce the most realistic effect. Thereafter, all the parts are geared together so that they work automatically. The speed of the leading horse's legs has been regulated to represent a horse running very fast, and the ground beneath him is made to move in the opposite direction at a speed which represents the ground that would be covered by a horse moving at this rate. Not the least effective feature of this advertising sign are the torches which appear at each side. The flames appear to be belching forth out of the braziers as if they were real fire, and they cast a lurid glare over the whole scene.

As an advertisement, the sign is undoubtedly a great success, for it gives the spectators an illuminated display such as they would be eager to pay for the privilege of seeing were it placed behind the walls of an amusement resort. The advertisement on the curtain consists of three lines, each line being provided with spaces for eighteen characters. As in other letter signs, any letter of the alphabet may be formed in any of the spaces if the right type bar is used to make the electrical connections to the lamps in this space. The letters are unusually well-formed, there being practically no distortion. The flashing of the signs, as well as the entire display, is effected absolutely automatically.



The giant driver of the leading chariot.

Bodies of the leading team set up for a test.



A massive steel structure of 60 tons weight supports the display.

A COLOSSAL ILLUMINATED ADVERTISING DISPLAY.

Sleeping cars for electric railways were introduced a few years ago by the Illinois Traction System, which has maintained a regular service between Springfield and St. Louis. Additional cars have recently been built for a service between Peoria and St. Louis, and these embody several new features. The former cars are of the Holland type. The new cars resemble the Pullman type, but having the sections separated by permanent transverse partitions. An important feature is that the passenger, arising in the morning, can fold the berth against the side of the car, and a folding chair in the open space then facilitates his toilet. The upper berths have large windows, extending up to the eaves of the roof. Each berth has electric lights (current being supplied by storage batteries), and a small locker for watches, jewelry, etc. Permanent partitions separate the sections, and at night the sections are shut off from the center aisle by curtains. The cars are not equipped with motors, but will be hauled as trailers, thus eliminating noise and vibration due to the machinery.

NOVEL ELECTRIC TOWING LOCOMOTIVE FOR CANAL LOCKS

BY HERBERT BRACKETT

The city of Bremen, after greatly improving the navigation of the lower Weser by deepening and straightening the channel, has found it necessary to construct a huge dam at a cost of $2,000,000 in order to prevent the water level of the upper reaches of the river from being injuriously lowered by the increased flow through the new channel. In this way the city has acquired, incidentally, a water power equivalent to about 16,000 horse-power, which is used for generating electricity for lighting and other purposes.

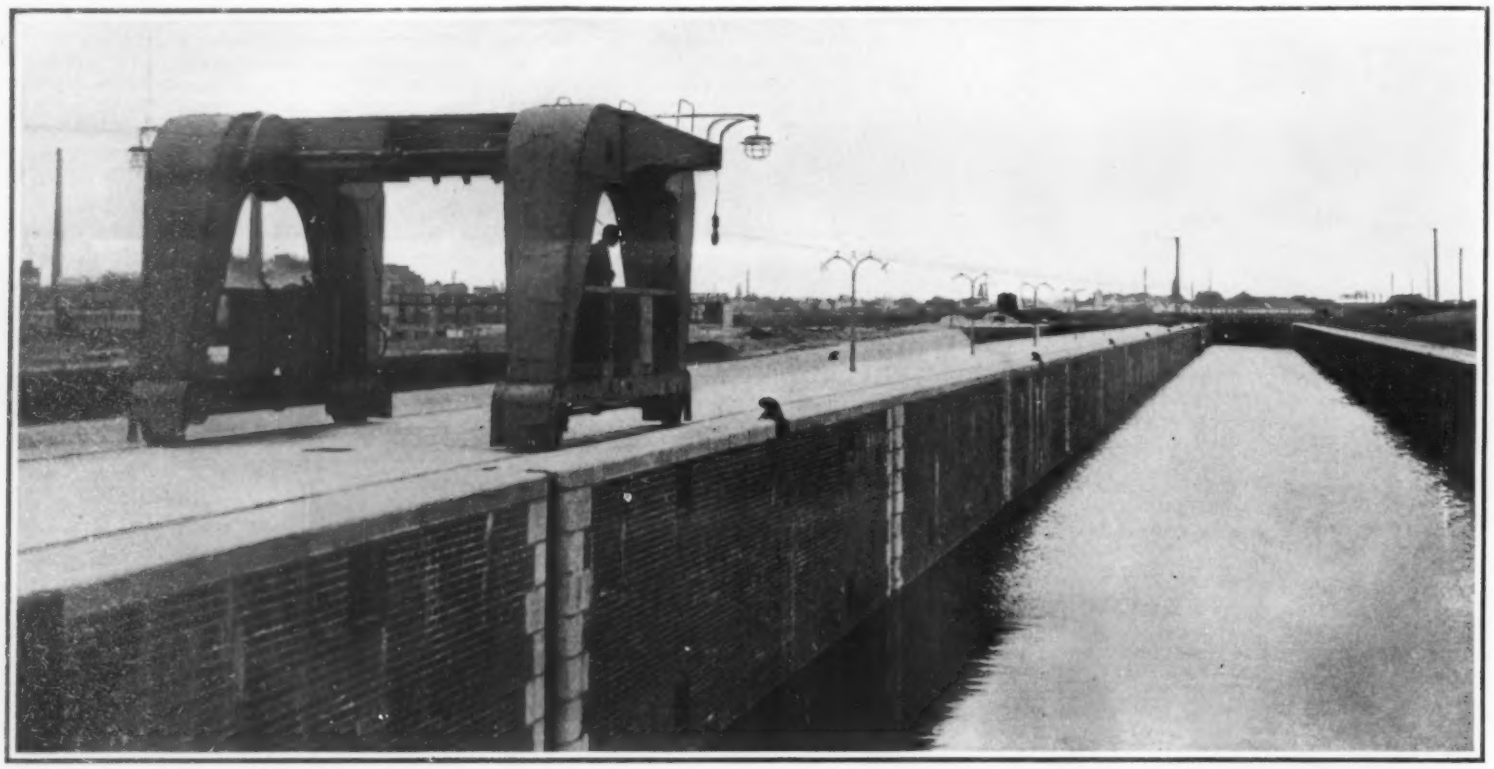
The extensive river traffic passes from one level to the other through two parallel canals, each of which has a single lock. The shorter of these locks is 230 feet long, while the longer lock has the remarkable length of 1,150 feet and can admit an entire tow, consisting of a tug and its usual convoy of barges, some of which have a displacement of 750 tons. These locks went into operation in November, 1908.

As only a small proportion of the river vessels can pass the locks under their own steam or by means of tugs, it was decided to facilitate the passage of other vessels and to shorten the time of transit, by the employment of an electric towing locomotive. Consequently, the wall, 21 feet thick, which separates the two canals and forms the north side of the great lock, was constructed in such a manner that it could be used as a railway. The employment of a locomotive of the type commonly used for such purposes, however, was prevented by several difficulties of construction and operation.

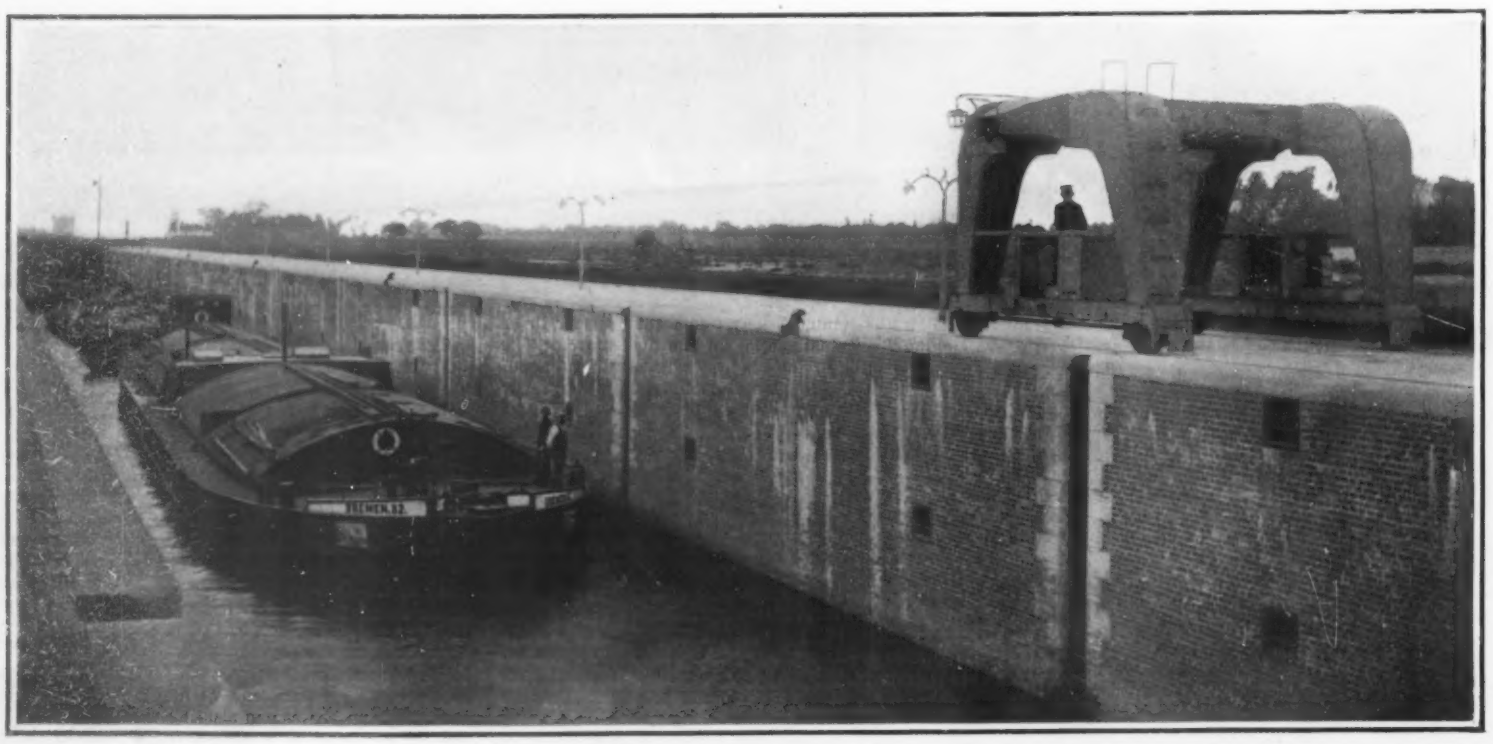
In order to be able to tow a vessel in either canal with such a locomotive it would be necessary to lay two tracks, one on each side of the wall, and connect them by a switch. This would have necessitated a great increase in the thickness and strength of the whole cap of the wall and a corresponding increase in cost. A still more serious obstacle was presented by the occupation of much of the area by the machinery for the operation of the lock gates.

After considering numerous projects the directors of the canal adopted a solution of the problem which was offered by the Allgemeine Elektricitaets Gesellschaft. The usual type of locomotive is abandoned and almost the entire width of the viaduct is free from tracks.

A single rail is laid on each side, so near the edge that it rests on the thick stone facing of the wall. The odd-looking four-legged locomotive shown in the illustrations runs on the wide gage track formed by the two rails. The bridge or transverse portion of the locomotive, which carries the electric motor, is high enough to clear all the lock machinery and houses, as well as the electric light poles, which also support the trolley wire. The power is transmitted to the wheels by shafts and bevel gearing, and the two wheels on each side are coupled together, so that all four wheels act as drivers. The required tractive ef-



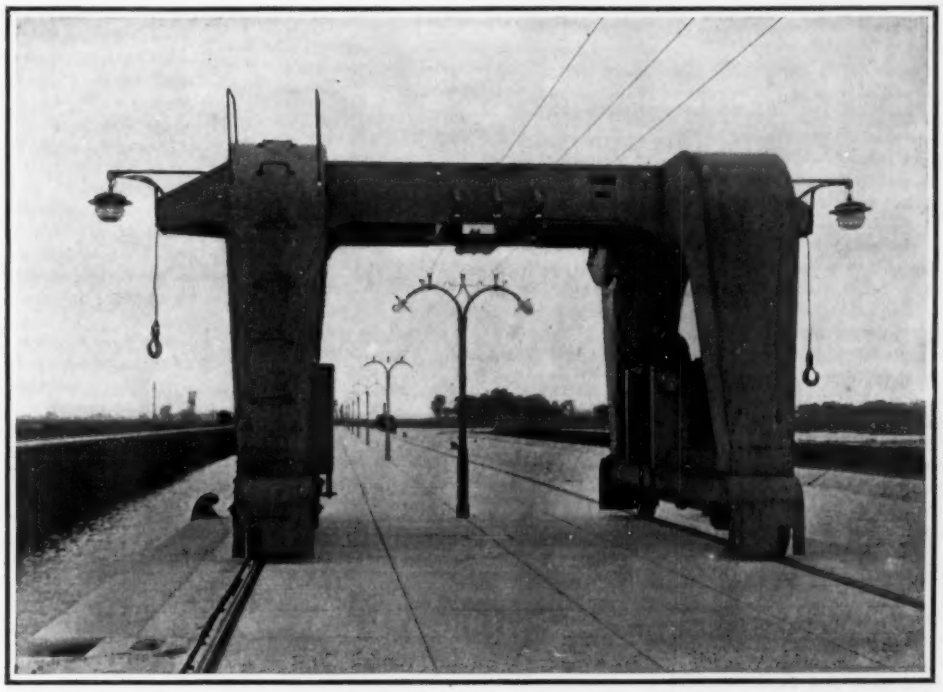
Bremen locks with towing locomotive.



The locomotive in operation.

A NOVEL ELECTRIC TOWING LOCOMOTIVE FOR CANAL LOCKS.

fort of 3,300 pounds was easily attained in the trial trip, and the motion of the locomotive is remarkably steady and uniform. The current is automatically cut off when the load exceeds a certain limit. The motor is operated by a tri-phase current of 220 volts, obtained by transforming a 7,000 volt tri-phase current, supplied by the municipal electrical station. The transforming station is on land and is connected with the trolley wire and the lighting circuit of 36 metallic filament lamps of 50 candle-power by watertight cables, passing through one of the locks. Each side of the locomotive is provided with a reversing controller, and with a separate controller for the electric winch which operates the tow line on that side. The two winches are in the transverse part of the locomotive, and the tow lines, which are more than 300 feet long, issue from the projecting ends of this part. This unique railway and locomotive were completed and put into operation in September, 1909.



THE NOVEL ELECTRIC LOCOMOTIVE BY WHICH VESSELS ARE TOWED THROUGH THE BREMEN LOCKS.

A Substitute for Ice in Skating Rinks.

The sport of skating can be enjoyed in warm weather, either by using roller skates, or by producing an ice surface by refrigerating machines. Both of these methods are now used. A third possible solution of the problem consists in producing a material which is as hard and smooth as ice, but remains solid at summer temperature. Such material can be made by mixtures of various sorts, but the surfaces so prepared in most cases offer too much friction for the use of ice skates. A coating of oil, or talc, does not last long, as the skates soon cut through it and expose the rough sub-stratum. A composition consisting of a crystalline mass, with the addition of oils which are miscible with water, has recently been patented in Germany. The oil covers each individual crystal so that its lubricating action is not confined to the surface, but permeates the entire mass. A floor of concrete, hard wood, or other suitable material is covered with the crystalline mass, either in the form of tiles, the interstices between which are filled with the hot saturated solution of the same material, or in the form of layers, produced by pouring the same solution on the floor. The composition consists of magnesium chloride, alum, boric acid, soda and a little strontium nitrate, which is added for the purpose of fixing any excess of water. Fats or oils which can be emulsified with water are added to the mixture, as stated above, for the purpose of diminishing friction. When the composition, which should be several inches in thickness, has hardened, its surface is scraped and treated with water or steam, as is done in the case of natural or artificial ice. This imitation ice is superior to artificial ice, because its maintenance requires no complicated machinery and very little expense. It is only necessary to fill with the hot solution any cracks which may form and to polish the surface with a scraper and steam or water from time to time. The small amount of the material which is abraded by the skates can be collected and used again. The same process can be employed with suitable modification for the preparation of inclines for coasting and tobogganing.

A combined curb and gutter of concrete is in use at Dayton, Ohio, and is composed of 1 part Portland cement and 3 parts sand, and is made in blocks of uniform length, not exceeding 7 feet. The blocks rest upon a gravel base, 6 inches thick, in which is laid a 3-inch tile drain where necessary. The width of curb is 6 inches, and the distance from its top to the gutter from 6 inches to 8 inches. The depth of the block is from 12 inches to 14 inches, and the width of the gutter from 12 to 24 inches. The old specifications, according to Mr. F. J. Cellarius, city civil engineer, provided for the usual form of concrete curb and gutter composed of a 1 : 3 : 6 concrete core and a 1 : 2 facing 1 inch thick. It was found that the cement facing did not adhere properly to the concrete core and would peel off, leaving the concrete backing exposed. The new form of gutter, however, is said to be highly satisfactory and costs very little more than the one formerly used.

AN IMPROVED BOOMERANG

BY WALTER LANGFORD

Many descriptions have been given of the boomerang, that remarkable weapon of the natives of Australia, which possesses the strange property of returning to the thrower, after having described in the air a series of erratic curves, which unfortunately have not yet been fixed by instantaneous photography. The Australians use boomerangs of various types, not all of which return to the point of departure. In particular the war boomerang, which is much larger than the hunting boomerang (4 feet in length, in the Arunta tribe) does not return to the thrower, but merely ricochets once or twice on the ground before striking the enemy in its whirling flight. Some of the hunting boomerangs are also simple projectiles, while others return to the point of departure if they fail to strike the quarry—a bird on the wing, for example. The Australians also employ a boomerang which returns after having traversed a distance of from three hundred to five hundred feet and which may be considered merely as an instrument of sport. To the same

(*Concluded on page 39.*)

Fig. 1.—The start.

Fig. 3.—The finish.

Fig. 2.—The turning point.

Redrawn from La Nature.

THE FLIGHT OF THE "CURVA," AN IMPROVED BOOMERANG.

MAGIC FOR AMATEURS—I

COIN AND HANDKERCHIEF TRICKS

BY W. H. RADCLIFFE

INTRODUCTION.

As actions speak louder than words, so is the magician a better entertainer than the story teller. At his command the emptiness of darkness is seemingly peopled with a thousand demons which amuse and astonish, and when his audience creeps off to bed they pull the covers over their heads and shiver with the fright of what they cannot hear or see. They have been shown mysterious things that they have never seen before—weird things they cannot explain—and the performer has won for himself a certain prestige and respect which he probably could not have secured in any other way.

The fireside entertainment or the after-dinner performance is not by any means the only occasion when the clever one in the art of magic reaps his reward. At school or college, in the office of the store, or at the club, he can increase his popularity, assure his reputation as an entertainer, and by his ability to "queer" those generally considered wiser than himself, obtain an advantage over them that in few other ways could be secured as easily, quickly, and cheaply.

The tricks in this series will appeal to all. They require no complicated apparatus; in fact, anyone with ordinary mechanical ingenuity can make all the apparatus from common objects which are to be found in every household, and by the use of the simplest tools, such as jack-knife, hammer, scissors, gimlet, etc. Needles, thread, bees-wax, and mucilage are other requisites easily obtained.

So many of the magical tricks illustrated and described in present-day literature require such intricate and expensive apparatus that the would-be magician is often discouraged at the start, and forsakes without further investigation a field that might hold out for him a very brilliant future. Owing to the extreme simplicity of the apparatus required for this collection, the expense and labor of making the articles are a minimum, being well within the means and ability of the average school-boy.

Practically all of the tricks can be shown to advantage after one or two rehearsals. Care has been taken not to introduce sleight-of-hand tricks requiring such skill of manipulation that prolonged practice is necessary before they are available. To be able to realize at once the reward of one's labor, is one of the chief advantages of this collection. With this purpose in view, no part of any trick, no matter how simple, is assumed to be already familiar to the reader, but each part is thoroughly described, and when necessary, illustrated.

So cunningly are most of the tricky little devices designed, that the quickness of the hand plays practically no part in deceiving the eye; in other words, the apparatus when made according to the directions, embody such skillful applications of the principles involved, as to make the presentation of the tricks extremely simple and well adapted to amateurs. In connection with the instructions, bear in mind that success in this art depends largely upon a strict observance of the following rules:

First. Never tell your spectators in advance what you are going to do. If they are forewarned, they will more easily study out the cause.

Second. Never perform the same trick twice in one evening before the same audience. It not only loses half its effect by repetition, but the spectators having just seen the trick performed will know what to expect; the result will, therefore, be the same as would follow the non-observance of the first rule.

Third Enter heartily into the spirit of the part you are performing. Force yourself to believe in your marvelous power as you would have your audience do, and you will achieve an almost unlimited mastery over their imaginations.

Fourth. Never get "rattled." Perform the trick easily, quietly, and gracefully. If asked to repeat a trick, do not flatly refuse to do so, but promise to repeat it later in some other form. Let the "other form," however, be based upon entirely different principles or clothed in a totally different garb. If unsuccessful in performing a trick, smile cheerfully and attribute it to the moon being in the wrong quarter or to a little misunderstanding between two of your "controlling spirits."

In preparation, arrange the tricks in a series of groups, with the first in each comparatively simple, and of such a nature as to prepare the audience for the greater marvel to follow. Each trick should depend upon a different principle than the one preceding, and there should be an interval of about two minutes between them, preferably filled in by music, to allow the performer sufficient time to make the necessary arrangements. The programme should be worded in the vaguest possible terms, so that the actual effect of the different tricks will not be revealed beforehand.

NO. 1. THE DISAPPEARING DIME.

Of all American coins the dime is, perhaps, the one most easily gotten rid of, magically, yet seldom can it be made to disappear so neatly and completely as in the following trick.

The apparatus required consists of a white unruled piece of writing paper *a*, Fig. 1; a dime *d;* two iron rings, *b* and *c*, each about one inch and a half in diameter; and a piece of white cardboard *e*, one inch and a half square, marked with the "skidoo" number, 23.

Almost any small iron rings of round section will answer the purpose so long as both of them are of the same size. If they cannot be found in the house, they may be purchased at a hardware store for a penny apiece. Cut the cardboard *e* so that its length on each side is the same as the outer diameter of the rings, whatever that may be. If a calendar is available, cut the number 23 from it and paste it on the cardboard, as such figures look much better than those drawn by hand.

The only other preparation for the trick consists in pasting across one of the rings, *c*, a piece of writing paper *s*, having the same color as *a*. The best way of doing this consists in cutting out a somewhat larger piece of paper than will cover the ring, placing this on a flat surface, covering one side of the ring *c* with mucilage and laying it, this side down, upon the paper.

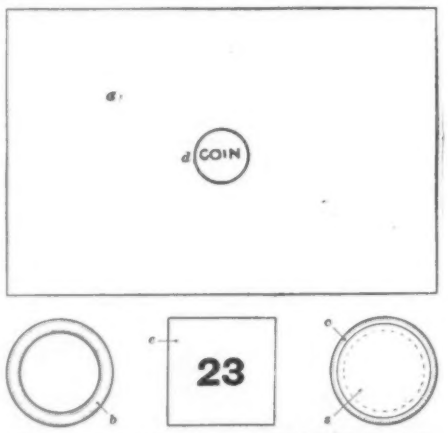


Fig. 1.—APPARATUS FOR USE IN TRICK OF THE DISAPPEARING DIME.

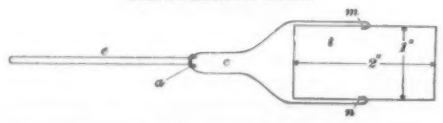


Fig. 2.—DEVICE USED IN TRICK OF CHANGING HANDKERCHIEF INTO A FLAG.

When thoroughly dried, cut the surplus paper from around the ring, so that none will be visible about the sides when the ring is resting with its paper side down.

In performing the trick, the dime *b* is placed in full view of the audience upon the paper *a*, which previously has been laid on a flat surface with the prepared ring *c* resting upon it, papered side down. The cardboard *e* is then laid across the top of the ring *c*, its numbered side uppermost, and upon this the other ring *b* is placed. The structure thus formed is next raised and placed upon the dime. After a few waves of the performer's hand across the pile, accompanied by his command of "Skidoo!" he removes first the upper ring *b*, and then the cardboard *e*, laying both on the paper, near the ring *c*.

To all appearances the dime has vanished, for it cannot be seen through the under paper-covering of the ring *c*, and as this covering is not distinguishable from the paper *a* beneath it, none except the performer knows the reason.

After the dime has thus been made to disappear, it can be brought back without any perceptible decrease in its face value. Covering the ring *c* as it rests in its innocent-looking position over the dime, with the cardboard (now turned with the "skidoo" number out of sight) and the ring *b*, the performer exclaims, "Come back!" Then raising the entire combination of rings and cardboard off the dime and placing them on another part of the paper, he shows that the coin has obeyed his command.

NO. 2. CHANGING A HANDKERCHIEF INTO AN AMERICAN FLAG.

Notwithstanding the title of this trick, it is necessary to procure the flag, which should be a small one—about eight by twelve inches—preferably of silk, because this material can readily be compressed into a small space. If such a flag cannot be obtained, a colored or dyed handkerchief conforming to the requirements may be substituted.

A simple and satisfactory device for holding the flag at the beginning of the trick, and afterward causing the handkerchief to vanish, can be made from a two-inch length of pasteboard mailing tube about one inch in diameter. Through diametrically opposite sides of this tube *t*, Fig. 2, midway between the ends a hair pin bent as shown at *c* should be inserted for about one-quarter of an inch, and the ends of the pin bent over as at *m* and *n*.

The loop at the middle of the pin provides a means of fastening the device to an elastic rubber band *e*, of such length and elasticity that when the free end of *e* is looped around the suspender button on the left side of the performer's trousers, the tube can be brought out in the left hand in front of the body, but when released will quickly fly back out of sight under his coat. A convenient form of loop to make in each end of the elastic band is that shown at *a*. Although but one elastic band *e* is shown in Fig. 2, it is perhaps advisable to use two, side by side; these should be about two inches long and not very thick. Not only is there greater range of movement with a given elasticity when two elastic bands are used in place of one, but there is less liability of the trick being spoiled by the breakage of the elastic.

Before commencing the trick loop the free ends of the elastic bands around the suspender button as previously explained, and tuck the flag in one half of the tube so that it is completely inclosed, with its center near the center of the tube and its edges near the end of the tube. Allow the tube thus loaded to hang from the elastic bands, under the coat, the loaded end uppermost. While procuring from the audience a lady's handkerchief, on account of its smaller size, secretly gain possession of the tube in the left hand.

Standing with the left side toward the audience, spread the handkerchief over the left hand, now raised in front of the body and surrounding the tube, and proceed to tuck in the open end of the tube the handkerchief, center foremost. Tell the audience that by simply passing it through the hand as shown, the electricity in the hand transforms the handkerchief into a beautiful flag.

With each portion of the handkerchief inserted in the upper end of the tube, pull out from the lower end an equal amount of the flag, so that the effect is as explained to the audience.

When all the handkerchief has been well tucked in the tube, arrange so that there yet remains a portion of the flag in the other end of the tube. Remove this portion with the fingers of the right hand under cover of the left, and tuck it in the left hand alongside of the tube. This enables the tube to be gotten away before the audience begin wondering where the handkerchief has gone. A few movements of the right hand as if to tuck in the last remaining traces of the handkerchief, after the tube and handkerchief have sprung back, greatly add to the effect.

The moment the grip of the left hand on the tube is released, the elastic band or bands pull the tube back out of sight. The bands when in use are screened from the audience by the left arm, so that they are not noticed. Let the performer give a slight cough as the tube flies back, to smother any suspicious noise made by the recoil of the bands. When the performer opens his left hand to show that he has the flag but no handkerchief, the astonishment of the spectators is ample reward for his efforts.

(To be continued.)

Before the American Electrochemical Society a paper was recently presented by Prof. Samuel A. Tucker and Mr. Farel L. Jouard on "The Electrolytic Preparation of Magnesium." Magnesium can be obtained by electrolysis of its molten chloride in the presence of potassium chloride, but the bath is troublesome and expensive to prepare. Electrolysis of magnesium fluoride with additions of other fluorides for dissolving oxide of magnesium give practically no metal, and there seems to be no direct solution of magnesium in such molten compounds. Alloys of magnesium with aluminium or copper are easily made by electrolysis with the use of a chloride bath.

ELECTRIC-LAMP HEATING AND COOKING DEVICES.

BY FRANK C. PERKINS.

As seen by the accompanying illustrations and drawings, some most interesting and unique electric heating and cooking apparatus, using incandescent lamps for supplying the necessary heat, have recently been developed.

By means of the ordinary carbon filament lamp of

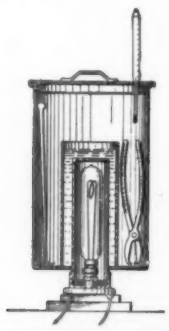


Fig. 1.—INSTRUMENT STERILIZER.

4 watts per candle, of low lighting efficiency, say about 5 per cent, and of high heating efficiency of about 95 per cent, a simple, cheap, and efficient electric heating and cooking apparatus may be made at home, whereby food may be cooked and materials heated to temperatures of 300 deg. F. or thereabout, with the least possible loss in heat.

The utensils used with the apparatus may be removed from the lamp and be placed in the dish pan and washed with the other dishes in a home without injury. In fact, a dozen different utensils may be employed in turn, with only one or two electric lamp

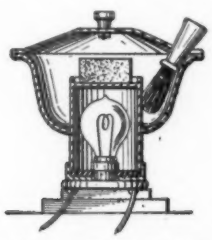


Fig. 2.—SHAVING CUP.

heater units, thus reducing the cost of electric heater units, and keeping the cost of the electric heating equipment at a very moderate sum for a large number of very serviceable and convenient devices.

In the barber shop the electric tubular lamp heater for sterilizing razors (Fig. 1) and the shaving cup (Fig. 2) may be used to advantage. The curling-iron heater (Fig. 3), as well as the sterilizer and electric shaving cup, may be utilized on the same base if desired. The dentist or surgeon may sterilize his instruments at slight expense, the same heater being utilized for other purposes.

The cost of construction is low, as ordinary tin uten-

Fig. 3.—CURLING-IRON HEATER.

sils can be employed, with dredge cans inserted in the bottom as a heat-absorbing shell, and the whole then either nickel plated or copper oxidized if desired.

It is well known that water is a good insulator of heat when circulation is interfered with, and it is also a great absorber of heat. For instance, a test tube several inches long, filled with water, may be held in the hand without discomfort at the lower end, while the water in the upper portion may be boiling at 212 deg. F. from the heat of a Bunsen burner flame.

In ordinary steam cookers and other similar devices, where a considerable quantity of water is heated in order not to boil dry, a considerable amount of heat is wasted when the cooking has been accomplished, by throwing away this large amount of water which has

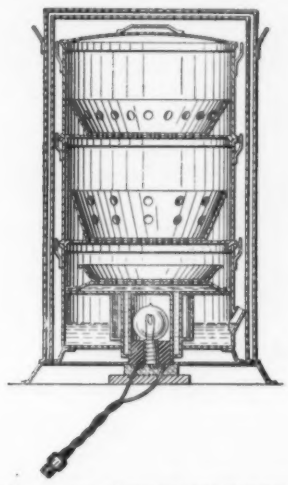


Fig. 4.—ELECTRIC VAPOR-COOKER.

absorbed an enormous amount of heat. Again, all of the water must be heated to the temperature of 212 deg. or thereabout before any of it will boil, when the heat is applied from the bottom in the ordinary manner.

For cooking itself the actual amount of heat required is very small as compared with the heat lost by radiation on a stove, and absorbed by the water, which is discarded after the cooking has been accomplished. In the electric steam and vapor cookers, with incandescent lamps, as seen in Figs. 4 and 5, it is only neces-

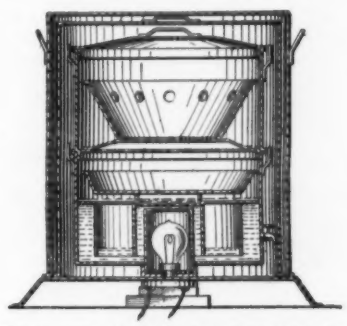


Fig. 5.—ELECTRIC "FIRELESS COOKER."

sary to heat a small film or thin layer of water to the boiling point, or thereabout, the vapor or steam arising from this small amount of water doing the cooking in the steamer, while the rest of the water is at a much lower temperature, and is utilized as a source of supply or storage, while it is, at the same time, absorbing heat that is ordinarily wasted by radiation.

The principle utilized in the ordinary fireless cooker is that the vast amount of heat absorbed by a body of water, when brought to the boiling point, is given up to

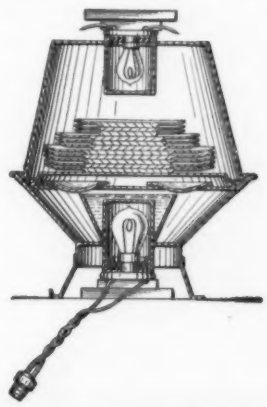


Fig. 6.—DISH WARMER.

the food to be cooked, when the whole is inclosed in a chamber well insulated by straw, asbestos, or other material, which prevents the heat from escaping to the outside of the cooker. It is well known that dead air space is one of the best heat insulators, and this is taken advantage of in the electric fireless cooker here shown by providing air chambers and outer shells with air spaces between the same for retaining the heat, the water boiling in the center, while the outer shell is comparatively cold. While with the ordinary fireless cooker the heat is all first absorbed by the water heated on the stove, and then given off to the food during the night, the electric cooker applies only a small amount of heat electrically, and continuously, for a considerable length of time, the food being hot and ready for service immediately in the morning. With the ordinary fireless cooker, not only must outside heat be applied to boil the water in the first place, but the food,

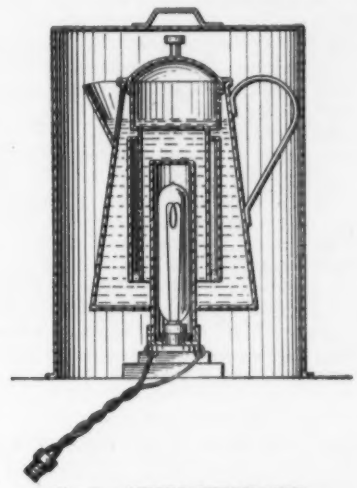


Fig. 7.—COFFEE PERCOLATOR.

while thoroughly cooked, must often be reheated a trifle in the morning before serving. This is a great annoyance, and the food might almost as well be directly cooked at once by ordinary means.

The electric vapor or steam cooker illustrated in Figs. 4 and 5 consists of a heat-insulating slate base, on which is mounted a porcelain electric heating lamp support, with electrical connections, the novelty of which consists of a porcelain cylindrical support, with a white surface for reflecting the rays from the heating lamp to the black-lined metal heat-absorbing shell which it supports. On the outside of the base the heat

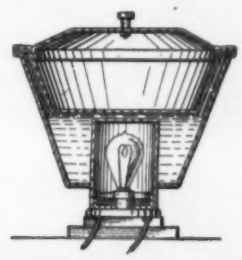


Fig. 8.—CEREAL COOKER OR GLUE POT.

from the electric lamp is absorbed by the inner black surface of the metal shell, and is communicated by conduction to the water surrounding this shell, which is in a cylindrical or cone-shaped chamber, containing only a thin layer of water, that may therefore be quickly brought to a steaming temperature. As may be seen in the drawing, an additional air or steam chamber is provided, surrounding this layer of water which is acting as a heat insulator, to prevent the rapid transfer of heat from the steaming water to the storage water in the outer surrounding chamber. Water from the reservoir is admitted through a hole into the hot-water chamber, and is forced in by the heated air in the upper part of the reservoir, also by the passage of heated air or vapor through the hole near the top of this chamber surrounding hot-water cylinder.

Outer shells are provided to furnish heat insulation and retain the heat within the cooking apparatus; and as the water is vaporized in the hot-water cylinder, it

Fig. 9.—EGG POACHER AND TEAPOT.

is continuously replaced on account of the increased pressure in the water storage chamber.

Another arrangement of the electric cooker steamer retains the principal feature of a thin shell, an insulating air, steam, or vapor shell chamber, and an outer storage chamber, the latter three being formed by a removable double cylinder, pressed down into the water, and forcing the same into the space between the cylinders and into the steaming water layer. An electric coffee pot has been designed along the same lines, the lamp heating the thin film of water, which rises through the coffee in the perforated receptacle at the top, and circulates down along the outside wall of the coffee pot.

As only a small amount of water is required for

poaching eggs, a novel combination egg poacher and plate warmer has been developed, as shown in Fig. 6. For warming the plates, such dry heat may be supplied as is necessary, and for poaching the eggs, a thin layer of water is utilized for a few minutes only.

Some of these cooking and heating devices are provided with resistance heat-regulating sockets, mounted between the supporting receptacle and the heating lamp, when found desirable, and another construction utilizes a thermostat plug between the porcelain receptacle and the tubular heating lamp for controlling the temperature as desired.

The electric sealing-wax heater is similar to the shaving cup, the wax receiving the heat by conduction from the shell itself, and when protected by an outer shell, a 4 or 8 candle-power lamp will keep the sealing wax continuously hot and ready for use in a bank, shipping or express office.

Another application of the incandescent lamp is that of the electric oatmeal cooker or glue heater (Fig. 8). An inner receptacle is heated by steam or water in the outer shell. In Fig. 9 will be noted a unique little tea steeper and egg poacher combined, for use in a sick room.

CARRYING WATER WITH THE HELP OF A HOOP.

BY A. F. BISHOP.

The accompanying sketch shows quite a clever wrinkle. I have used it a good many times, carrying

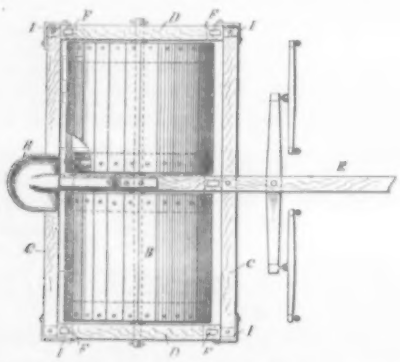
CARRYING WATER WITH THE HELP OF A HOOP.

water from quite a distance, and find the hoop a great help. It keeps the pails from chafing the limbs; you merely take the weight. You allow the pail handles to rest against the outside of the hoop. The hoop should be about 26 inches in diameter. It can be made out of a barrel hoop by splicing in a piece of another to give the desired diameter. The splices can be bound tightly with a cord, which will answer all purposes.

A CHEAP HOME-MADE ROLLER.

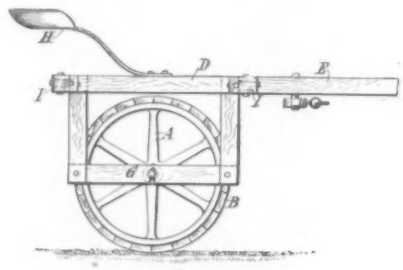
BY C. A. UMOSELLE.

To make a good roller at a cost of less than $5, get four old mowing-machine wheels *A* with their axles; break the lugs off the wheels with a hammer, and have ⅝-inch holes drilled in the rims 4 inches apart for the body. Cut 2 x 4 oak scantlings *B* in 3-foot lengths, dressing the inner corners so the outer edges



PLAN VIEW OF A ROLLER MADE FROM MOWING-MACHINE WHEEL.

will fit closely when they are laid flat against the rims of the wheel, where they are to be bolted fast. For the frame use 4 x 4 stuff, cutting two pieces *C* each 7½ feet long for the front and rear members. Two inches from each end cut a 1 x 3 mortise, in which to frame the side timbers *D*, and in the center of each piece cut a 2 x 4 notch for the tongue *E*, which is also of 4 x 4 stuff, long enough to reach the rear of the frame and form its central member. Cut the side members *D* of the frame long enough to let the frame clear the roller, making tenons on the ends to fit the mortises in the front and rear pieces. Now put the frame together and pin it, bolting the tongue on solidly. If you can get three metal boxings to fit the axles, do so; if not, make hardwood boxing *G*, using mortise and tenon connections *F* where it joins the members *D*. Now put the frame over the two sections of the roller, putting the axles in the boxes and fastening them so that they cannot come out. Attach an old mowing-machine seat *H* to the frame, so the driver's weight will balance the tongue and take the weight



SIDE VIEW OF THE ROLLER.

off the horses' necks. To further strengthen the frame, it is best to have four corner irons *I* made with four holes in each to bolt into the corners, making all solid; then the roller will be complete. Anyone who is at all handy with tools can make a good one in a day. I have one that was made six years ago, and it is just as good as a $35 roller.

EASILY CONSTRUCTED ELECTRIC TOASTER.

BY R. H. CRONYN.

An electric toaster can be made at a cost of less than a dollar, and without much work, which will nevertheless prove very serviceable. The following are the necessary materials: A piece of asbestos wood, ⅜ by 7 by 17 inches; 22 screws, and 4 stove bolts with 8 nuts. If asbestos wood cannot be obtained, use slate of the same size and a thick piece of sheet asbestos 14¼ by 6¼ inches. In this case, 26 stove bolts and 30 nuts will be required. The other materials necessary are 2 binding posts, a piece of wire netting (not soldered) 14 by 15½ inches, 5 or 6 feet of flexible lamp wire, 1 lamp plug with fuse, about 40 feet of No. 20 German silver wire, and 22 small porcelain insulators about half an inch high.

If slate is used the first thing necessary is to bore holes through it with an awl at the points indicated in Fig. 1. The two rows of holes in brackets marked *A* are 5¼ inches apart, and each hole should be separated from the next by a space of 1⅜ inches. The holes *B* are adapted to receive bolts, by means of which a piece of wood is clamped down on the slate and asbestos to keep the asbestos in place, as indicated in Fig. 3. The holes *C* are required for a pair of binding posts, while the holes *D* are used to receive four bolts, which serve as legs for the toaster. The holes marked *A* are adapted to receive bolts *F*, which fasten the insulators to the base. If asbestos wood is obtainable it will be unnecessary to drill these holes, for the insulators may be held in place by means of screws.

After the base has been prepared, the German silver wire is annealed by passing it through a flame until it is red hot, but before annealing, it should be wound in a long spiral spring by coiling it about a heavy wire or nail. The coil is now laid on two bricks, and

Fig. 1

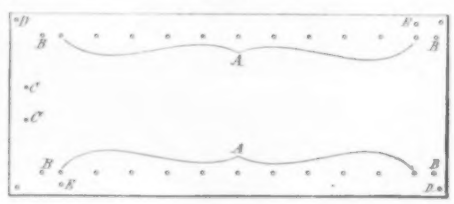
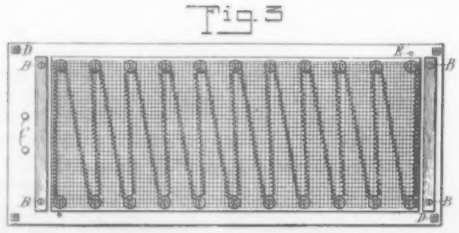


Fig. 2

Fig. 3



ELECTRIC TOASTER OF SIMPLE CONSTRUCTION.

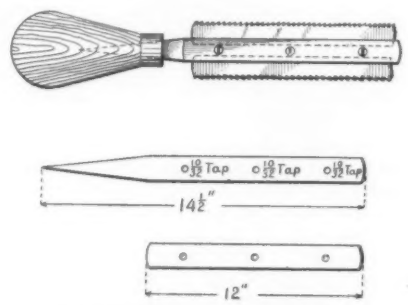
the current is passed through it. If it remains black, although it gives out heat, it is too long. To find the right length, one of the wires through which the current is conducted is moved along the coil until a place is found where the spring remains a dull red. It should not be allowed to become hotter than this. At this point the coil is cut off, and then it is stretched out to a length of 12 feet. One end is secured to one of the insulators at the end of the row, and then the coil is passed back and forth about the insulators from one row to the other. At each insulator the coil is stretched out, so that it passes, as a single strand, about the insulator. The ends of the coil are carried through the holes *E* to the under side of the base plate, and connected to the binding posts *C*.

The toaster may now be tested by connecting it up to a lamp socket, using a 5-ampere fuse wire in the plug. If everything is satisfactory, the wire netting may be placed over the insulators and fastened down at various points by means of the bolts *F*, which are temporarily withdrawn from the insulators, and then inserted again through the wire netting.

HOLDER FOR BROKEN SAW BLADES.

BY T. FAGAN.

When the blade of a hack saw is broken—and every one knows that they break very easily—it is usually thrown into the scrap heap, because there is apparently no further use for it. The break may occur at the very end of the blade, leaving a long section that would be perfectly serviceable were there some method of mount-



HOLDER FOR BROKEN SAW BLADES.

ing it in a saw handle. The accompanying sketch shows a very simple method of doing this. Take a piece of ½ by ⅛ band iron, 14½ inches long. Taper one end of it, so that it may be driven into a wooden handle. Three holes should be drilled in the band iron, and threaded as indicated in the sketch. A second piece of band iron 12 inches long should be drilled with holes to mate the tapped holes in the other piece. The two plates are then clamped together by means of screws, and provide a pair of jaws between which two saw blades may be gripped. Any serviceable length of saw may thus be utilized for making shallow cuts.

A CONVENIENT DRAWING-BOARD.

BY CHAUNCEY W. NIEMAN.

A wooden drawing board, with T-square, thumb-tacks, and the other paraphernalia, is too heavy and clumsy for quick or intermittent use. The carpenter, machinist, or the man whose work is mostly at a business desk, cannot find space or opportunity to set himself seriously to mechanical drawing, and the result is a free-hand sketch which it takes time to explain to the workman, and which often leads to mistakes or demands for more time-wasting explanation.

The writer has found a board such as illustrated herewith to be of immense value. It can be constructed

A CONVENIENT DRAWING BOARD.

in about fifteen minutes. Procure a good, heavy piece of straw-board of convenient dimensions, and along one side glue a smooth-edge of wood one-eighth inch thick and about half an inch or a full inch wide. A paper clip at the top and two triangles complete the equipment. No thumb-tacks will be necessary; for if one clip does not hold firmly, two certainly will. One of the triangles should contain 60 deg. and 30 deg. angles, and the other two 45 deg. angles. Which will be found a handy equipment for all classes of work. There are many really fine points about this board which cannot be appreciated until tried, and the well-equipped professional draughtsman who may be inclined to sniff at anything so simple would be wise to restrain his scorn until he has seen one in use.

RECENTLY PATENTED INVENTIONS.

Electrical Devices.

SECONDARY BATTERY.—H. P. SCHREIBER, 35 Grosvenor Mews, New Bond street, London, England. The positive electrode consists of a lead or lead alloy tube pasted inside with suitable paste containing lead and its oxids. The negative electrode consists of a smaller tube of lead pasted outside with metallic lead paste, placed concentrically in the electrode, the electrodes and layer of paste of such form and dimensions that the charging of the cell causes the paste on the negative electrode to contract and bind very firmly on to the tubular electrode, while the charging also causes the active material on the positive electrode to expand and bind firmly against the inner side of the electrode.

Of Interest to Farmers.

FEEDER FOR GRAIN-BEARING STRAW.—S. B. MCCOMB, Zenith, Kan. The objects here are: to provide a mechanism for extracting wheat or other grain from a stack and delivering it to a threshing machine; to provide a mechanism for delivering the wheat from a stack to a threshing machine, which may be operated from either side of the threshing machine; and to provide a construction for these objects, which is light, simple, and durable.

VINE-CUTTER FOR SWEET POTATOES.—D. W. LINDSEY, Poplar Branch, N. C. This attachment for plows, while useful in cutting vines of various kinds, is especially designed for cutting vines of sweet potatoes. It can be readily applied to a plow and secured in place thereon and will efficiently operate to cut vines so that the same can be readily cleared out of the way to facilitate harvesting of the potatoes.

COTTON HULLER AND CLEANER.—J. L. HART, Chickasha, Okla. An object of this inventor is to provide a device in which the bolls are broken up and the hulls removed without cutting or tearing the cotton, and thereby preserving the fiber in its natural state, and at the same time breaking up the hulls so that they be readily removed without mashing or grinding them and thus adding further impurities and increasing the inconvenience of cleaning the cotton when the hulls have been removed.

Of General Interest.

LADDER.—JOSEPH VAGHI, Bethel, Conn. In order to provide safe escape in case of fire, and to allow firemen to reach upper stories of a building quickly, a ladder has been invented, having its side bars formed of lazy tongs, while the rungs serve as pivots of

FOLDING FIRE-ESCAPE LADDER.

the lazy tongs' links. The ladder may be folded compactly, and when in use is locked in an extended position by means of latches at the lower end, and is spaced a sufficient distance from the face of the building to allow convenient ascent and descent of persons using the ladder.

SECURING DEVICE FOR CHAIRS.—J. J. ASTOR, New York, N. Y. This improved steamship chair may be firmly secured to the floor at any point desired, or may be readily and quickly released to permit it to be moved about. The holding means includes a suction or vacuum cup supported beneath the chair and adapted to engage with the floor, and provided with means for operating it to make or break the vacuum, to secure or release the chair.

CEMENT-BLOCK-MOLDING APPARATUS.—J. I. TAYLOR, Rock Rapids, Iowa. The improvement is an apparatus for molding cement blocks which are formed of side blocks or portions connected by means of transverse bars or rods. It is embodied in the construction and combination of parts whereby provision is made for supporting, during the molding operation, the transverse bonds which are embodied in the block when molded.

ROAD GRADER.—S. A. STONE, Chillicothe, Mo. An object of this invention is to provide a device which will scrape the road and round the center of the road, but which will not skid while drawing the dirt from the sides to the center of the road. A further object is to provide a device having means for adjusting the positions of both the forward and the rear end of the scrapers. The device has a pair of scrapers symmetrically disposed and provided with cutters for digging out the earth at their forward ends, and raised slightly at their rear ends to ride over and crush the clods.

STRAW-DISPENSER.—A. BERMAN, Atlanta, Ga. This invention comprises means for dispensing straws to be used at soda fountains and the like. An object is to provide a retainer for use in holding the straws which will keep them in a sanitary condition, free from dust and germs, and permit them to be readily withdrawn for use. The straws may be raised into position for extraction from the receiver, so that the latter will automatically assume such position.

AIR-COOLING APPARATUS.—R. G. WILSON, Alaska, W. Va. Mr. Wilson's invention is an apparatus for use in humidifying and cooling air in living apartments, factories, etc., in which a fabric or curtain of absorbent material is suspended from a horizontal pipe to which water is admitted and from which it is allowed to trickle down over the fabric or curtain.

DISPLAY-STAND.—J. M. WALTERS, Los Angeles, Cal. Provided in this invention is a construction of display head rounded on one side and flat on its other side and having sockets for a stand rod formed from both sides and arranged at different angles to each other so that the display head may be adjusted with its flat or its rounded side upward and held at any desired angle as may best suit the decorator's taste.

Household Utilities.

EGG HOLDER AND CUTTER.—A. A. ANDERSON, New York, N. Y. In this instance the aim is to provide a holder arranged to securely hold an egg in a vertical position, to permit of readily cutting the shell near the top thereof without spilling the contents of the shell or soiling the fingers of the operator, and to allow convenient adjustment for accommodating eggs of different sizes.

STOVEPIPE-COUPLING.—E. J. BABBITT, Onaway, Mich. This invention has reference to couplings or fastenings for positively locking together the ends of stovepipe sections, and has for its object to produce a simple and efficient device for fastening together the ends of stovepipe sections. It consists of a detachable and removable latch which may be applied to the ends of the stovepipe sections.

Machines and Mechanical Devices.

ELEVATOR-BRAKE.—F. A. J. SCHULZ, Bronxville, N. Y. The principal objects in view in this case are: to provide automatic means whereby the elevator car is arrested in event of accidental breakage or other effect which would cause the car to fall and to provide a mechanism for the accomplishment of the above object, which automatically releases or adjusts itself upon the needed repair being consummated on the car.

LAWN-SWING FAN.—J. E. HALL, Greenville, Ill. Among the principal objects of this invention are: to provide a fan and operating mechanism therefor to be operated by the swaying of the swing; and to provide a fan and operating mechanism therefor adapted to be quickly and readily attached to and detached from the swing frames of ordinary construction.

VALVE.—T. P. LONG, Barberton, Ohio. Among the principal objects which the present invention has in view are: to provide a mechanism for rapidly opening and closing valves in the employment of which the lateral strain upon the valve stem is minimized; and to provide a mechanism for rapidly opening and closing valves which is simple, durable, and efficient.

Prime Movers and Their Accessories.

ROTARY ENGINE.—G. E. CALLAWAY, Jonesboro, La. This invention pertains to rotary engines, and particularly to multiple expansion rotaries and reversible rotaries. An object is to provide in a rotary engine a plurality of rotating pistons adapted to take steam at the smaller expansion of such steam through the several pistons to the larger.

Railways and Their Accessories.

LOCOMOTIVE ASH-PAN.—W. W. SYKES, Manchester, Va. This invention is an improvement in ash-pans especially designed for locomotive use, although the invention may be embodied in ash-pans for use in other purposes, and it includes improvements in the dumping bottoms of the ash-pan and especially improvements in the means for washing off the rocking sections of the dumping bottom.

Pertaining to Vehicles.

AUTO-SLEIGH.—O. J. TUBBS, Waterville, Maine. This invention relates to a sleigh of the automobile or self-propelled type. An object is to provide a device having a plurality of propelling means so arranged as to allow relative movement over a rough roadway, and also provided with simple means for yieldingly holding the propelling wheels to their work.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Notes and Queries.

Kindly write queries on separate sheets when writing about other matters, such as patents, subscriptions, books, etc. This will facilitate answering your questions. Be sure and give full name and address on every sheet.

Full hints to correspondents were printed at the head of this column in the issue of June 18th, 1910, or will be sent by mail on request.

(12256) D. G. E. asks: Will you kindly tell me what is the source of the number 3.1415926536+? I have often wondered how it is derived. Surely not from measurement to millionths? How then? Is it a root of some quantity? A. The number 3.14159+ is derived by a process of demonstration given in all geometries, in the book treating of the circle. It is there shown that a regular figure may be drawn around a circle and another just like it in shape may be drawn within the same circle. Thus a square may be drawn around a circle so that all the four sides of the square shall touch the circumference, and another square may be drawn within the circle so that its corners shall just touch the circumference and its sides shall be parallel to those of the first square. The circumference of the circle is wholly between the two squares, and its length must be intermediate between the distances around the two squares. The diameter of the circle is equal to the side of the outer square. If this be taken as unity, say one foot, the distance around the outer square is four, and by calculation the distance around the inner square is found to be 2.828427. If in the same manner the figures of eight sides are drawn by bisecting the sides of the squares, and calculating the sides of the octagons, we have for the distance around the external octagon, 3.313708, and for the inner octagon, 3.061467. This process is carried on to figures of 16, 32, 64, 128, 256, 512, and 1,024 sides, by doubling the number of sides at each step. When the figure having 2,048 sides is calculated, the external figure has a distance around, or perimeter, as it is named in geometry, 3.1415951+, and the inner figure has a perimeter, 3.1415914+. Since the circumference of the circle is all the time intermediate between these values for the outer and the inner figure, and since the diameter of the circle was taken as unity, it follows that the circumference of any circle may be found correctly to five places of decimals by multiplying its diameter by this number. When 8,192 sides are employed, the results are in closer agreement. The outer figure gives 3.1415928, and the inner figure gives 3.1415926, differing only in the seventh place of decimals. The agreement can be carried still farther, and has been carried to 250 places of decimals. It is sufficient to use four places in ordinary calculations, or even 22/7, the nearest value in common fractions. For extended astronomical calculations a larger number is employed. It is thus seen that this number is of the highest accuracy.

(12257) A. M. L. asks: Will you please give me information toward directing me how to mix cement or concrete and form it into cheap tunnel-shaped vegetable houses, and whether any special form of ventilation therefor is preferable to another, and how obtained? A. A common mixture for concrete, where the strength is not required to be the greatest, is 1 cement, 2 sand, and 8 small broken stone. The proportion may be increased to 1—2—6 for posts, and 1—2—4 for thin slabs such as roofs. SCIENTIFIC AMERICAN SUPPLEMENT Nos. 1575, 1576, and 1577 treat very fully on the use of cement and mortar and concrete for farm purposes, making steps, posts, and walls, and other useful constructions. We will send you any of these numbers for the regular price of ten cents each.

(12258) W. D. S. asks: Please send me the SUPPLEMENT or your SCIENTIFIC AMERICAN containing "Process of Making Semi-Steel Castings." A. While there are a number of articles in our SUPPLEMENT describing the process of making castings, we do not find one directly descriptive of the mixture known as semi-steel. Semi-steel is made by the admixture of a small quantity of steel borings in the ladle, the steel being thrown directly into the melted iron. In a large ladle containing several tons of iron, the steel may be put in in large pieces, such as short sections of railroad rails. A flux or alloy is sometimes used to facilitate the mingling of the two materials, but it is not absolutely necessary. The publication The Foundry has advertisements of makers of such fluxes.

(12259) F. H. M. asks: I want to use fir and spruce for fence posts. They only last two years or so, I am told. Do you know of a preparation to dip them in that will preserve them? A. The permanent preservation of wood in moist earth is impossible. Decay can be delayed by tarring the wood with common coal tar or by creosoting the timber. Articles on the preservation of wood have appeared from time to time in our columns, and numbers containing these articles can be had at current rates.

NEW BOOKS, ETC.

OBERAMMERGAU AND THE PASSION PLAY. By Rev. E. Hermitage Day, D.D., F.S.A. Milwaukee: The Young Churchman Company, 1910. 24mo.; 96 pp. Price, 70 cents postpaid.

This is a practical and historical handbook for visitors, and deals with the story of the Passion Play, the spirit of the Passion Play, the approach to Oberammergau, the village of Oberammergau, the structure of the Passion Play and synopsis of the Play, the origin of religious drama, notes on the music, books on the Passion Play, dates of the Passion Play, and cast of the Passion Play. It is a very complete little book, just right to slip in the pocket. It should be in the hands of all those who are thinking of visiting this great play.

THE NEW BUILDING ESTIMATER. By William Arthur. New York: The David Williams Company, 1910. 16mo.; 477 pp. Price, $2.50.

This is a practical guide to estimating the cost of labor and materials in building construction from excavation to finish, with various practical examples of work presented in detail and with labor figured generally in hours and quantities. It is a hand-book for architects, builders, contractors, appraisers, superintendents, and draftsmen. This book, which is now in its third edition, has stood the test of time admirably. It gives the approximate price and the various methods of computing the cost of building materials of all kinds. The compilation of a book of this nature is particularly difficult, and the author is to be congratulated on such a creditable production. The only criticism that could be made on it is that the somber binding is accentuated by a funereal brown edge, which is not at all handsome, although it undoubtedly prevents the edges from looking dirty after use.

ESTIMATING FRAME AND BRICK HOUSES, BARNS, STABLES, AND OUT-BUILDINGS. By Fred. T. Hodgson. New York: David Williams Company, 1910. 16mo.; 252 pp. Price, $1.

This useful little work contains a detail estimate of a $5,000 house and additions; each room is taken up by itself, instructions are also given as to estimating by cubing, by the square of floors or walls, and by the process of comparison, with hints and practical suggestions for taking measurements and making tenders for work. The present volume is the eighth edition, which is an excellent guarantee of the reception which the book has received.

THE SHIP-DWELLERS. By Albert Bigelow Paine. New York: Harper & Brothers, 1910. 12mo.; 394 pp. Price, $1.50 net.

The account of a Mediterranean voyage touching many countries, and full of descriptive color, but relying most for its excellence upon the many-sidedness of its author's alert and sensitive mind, and upon his unfailing humor. By way of beginning, Mr. Paine describes the influence exerted upon his boyish imagination by Mark Twain's "Innocents Abroad," and how his mind dwelt especially on that illustration in the book which showed the outward-bound "Innocents" on the deck of the "Quaker City." When he grew up, and knew that such voyages were really possible, he prepared for a pilgrimage to Mediterranean lands.

ELEMENTARY COURSE IN PERSPECTIVE. By Sherman M. Turrill, C. E. New York: D. Van Nostrand Company, 1910. 12mo.; 71 pp. Price, $1.25 net.

The author has endeavored to illustrate the mechanical application of principles of descriptive geometry to the making of a perspective drawing. Two methods are used; first, the method by use of the plan, where the orthographic projections of rays are used, and the method by scale. It is assumed that the student is more or less familiar with descriptive geometry. The subjects taken have been selected with a view toward illustrating important principles and for their general interest. There are 16 illustrations and folding plates.

HICKS' BUILDERS' GUIDE. For Carpenters, Contractors, and Builders. Revised and enlarged by I. P. Hicks. New York: David Williams Company, 1910. 12mo.; 166 pp. Price, $1.

This valuable book comprises a practical system of estimating material and labor. Twenty thousand copies have been sold, and it is one of the best-known builders' guides, of which so many are being issued at the present time. In fact, one publisher has sent three to the reviewer's table in one package.

HARDY PLANTS FOR COTTAGE GARDENS. By Helen R. Albee. New York. 1910. 12mo.; 390 pp. Price, $1.60 net.

A personal and very readable record, illustrated by photographs, of the author's success in assembling within a limited area, the choice varieties of hardy shrubs, annuals, and perennials, so arranged as to give a succession of bloom of pure color in each bed. With a list giving manner of growth, height, time of blooming, exact color, special requirements of soil and moisture, "easy ways" taught by experience, and many etceteras of vital importance. This book appears in the very attractive garb of the American Nature Series. The gold contrasts beautifully with

the dark green. The illustrations are excellent and are well chosen and well executed. It is a delightful book and is worthy of a considerable sale. There is an excellent garden diagram.

INTERNATIONAL LANGUAGE AND SCIENCE. Considerations on the Introduction of an International Language into Science. By L. Couturat, O. Jespersen, R. Lorenz, W. Ostwald and L. Pfaundler. Translated by F. G. Donnan.

The five authors of this book are well-known scientists, biologists, and physicists, and peculiarly competent to discuss the very important question of an international auxiliary language. Volapük was long ago found wanting and has been abandoned, although it was a serious attempt in the right direction. More successful is Esperanto, which has had perhaps the largest following of any language, but which is nevertheless far from being perfect. The Commission for the Adoption of an International Auxiliary Language, of which the five authors of this book are members, was intrusted with the task of investigating the general question of an international language, and resolved to work out, on purely scientific principles, a tongue on the basis of Esperanto. The present state of the question is discussed, and the remarkable advances already made are set forth. Each authority voices the views of his peculiar scientific or literary world. Seven chapters comprise the book. In the first, Prof. Pfaundler points out the need for a common scientific language, particularly in the case of international congresses, and urges the teaching of an international language instead of modern languages in universities, because the teaching of modern languages really leads to no practical result, in his opinion. Prof. Lorenz outlines the purpose of the International Commission for the adoption of an international auxiliary language. Prof. Jespersen writes on the linguistic principles necessary for the construction of an international auxiliary language, with an appendix criticising Esperanto. Prof. Jespersen has been perhaps the keenest critic of Esperanto, and has in turn been most hotly assailed by those Esperantists who resent any attempt to correct the deficiencies of Esperanto. Couturat, in an admirable chapter on the application of logic to the problem of an international language, points out the correct methods of founding an international language by borrowing stems from European languages, according to the principle of maximum internationality, and that "an international language is nothing but a purified and idealized extract, a quintessence of the European languages." Dr. Lorenz, writing on the relationship of the international language to science, shows the practical value of the principle of internationality, and points out that the thousands of words in scientific and technical nomenclature which are coined to meet scientific exigencies are so closely bound up with the life and existence of science, that investigators have long become accustomed to write and think in a definite scientific language, apart from their nationality. Hence an international language would simply carry scientific expression one step further. He also indicates that the auxiliary language of the future must be chiefly Romance in its character, because Latin is the international language which still lives and flourishes for, and by reason of, science. In discussing the important question of nomenclature in the sixth chapter, the distinguished chemist W. Ostwald suggests that it would not be practicable to intrust the construction of the vocabulary to special commissions for each of the sciences, but that it would be more advisable to appoint a certain number of persons to collect the material and to make out lists of the concepts for which terms are required, and then to appoint a commission representing a whole group of sciences to discuss the necessary principles, after which the details could be worked out and finally subjected to the examination and approval of the whole body. In the last chapter, on reading, writing, and speaking, Prof. Pfaundler tells how an international language should be learned.

EPITOME OF THE AERONAUTICAL ANNUAL. Edited by James Means. Boston: W. B. Clarke Company, 1910. 8vo.; 220 pp. Price, $1.

The original numbers of the Aeronautical Annual were published in 1895, 1896, and 1897 in the infancy of the art of flying. In fact, they were far ahead of their time. These numbers have been out of print for many years, and are now greatly sought after, so that this Epitome will be more than welcome. It contains a number of articles by men of the highest importance in the history of aeronautics. The first article is by the lamented Otto Lilienthal, with illustrations showing his gliding experiments. There is another article entitled "Our Teachers in Sailing Flight," also by Lilienthal; then follow two more translations from the pen of this great pioneer; then comes the "Otto Lilienthal Memorial Address" by Carl Müllenhoff. Some idea of the primitive experiments may be gained when it is stated that the fatal descent of Lilienthal was made from his artificial mountain only fifty feet in height. The apparatus tilted and shot down rapidly, the daring sportsman was dragged from the debris, his spine broken, and he died twenty-four hours later. Then follows an engraving and a bibliographical notice of Mr. Octave Chanute, who now rejoices in having seen his anticipations realized. The experiments of Chanute are described by himself in detail. Then come various other papers which are now of considerable historical value, from the pens of such writers as Sir Hiram S. Maxim, Percy S. Pilcher, Prof. Langley, and Prof. A. Lawrence Rotch. The last of the "Memorable Events" brings us up to the flight of Paulhan from London to Manchester, April 27th and 28th, 1910.

HYDRAULIC ELEVATORS. Their Design, Construction, Operation, Care, and Management. By William Baxter, Jr. New York: McGraw-Hill Book Company, 1910. 8vo.; 326 pp. Price, $2.50. net.

This book represents a stupendous amount of labor and fills a most valuable niche in technical literature. The clear, concise descriptions and the clarity of the illustrations render the book of the greatest possible value to architects and engineers. Every type of modern elevator which is in use to-day will be found illustrated.

Legal Notices

60 YEARS' EXPERIENCE
PATENTS
TRADE MARKS
DESIGNS
COPYRIGHTS &C.

INVENTORS are invited to communicate with Munn & Co., 361 Broadway, New York, or 625 F Street, Washington, D. C., in regard to securing valid patent protection for their inventions. Trade-Marks and Copyrights registered. Design Patents and Foreign Patents secured.

A Free Opinion as to the probable patentability of an invention will be readily given to any inventor furnishing us with a model or sketch and a brief description of the device in question. All communications are strictly confidential. Our Hand-Book on Patents will be sent free on request.

Ours is the Oldest agency for securing patents; it was established over sixty-five years ago.

MUNN & CO., 361 Broadway, New York
Branch Office, 625 F St., Washington, D. C.

PATENTS SECURED OR FEE RETURNED
GUIDE BOOK and WHAT TO INVENT

With valuable List of Inventions Wanted sent free. ONE MILLION DOLLARS offered for one invention; $16,000 for others. Patents secured by us advertised free in World's Progress. Sample free.

VICTOR J. EVANS & CO., WASHINGTON, D. C.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending June 28, 1910,

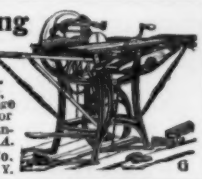
AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

Acid from smelter gases, making sulfuric, Channing & Falding ... 962,493
Adjustable clamp, C. C. Butler ... 962,620
Air brake, J. F. McElroy ... 962,517
Air brake apparatus, H. F. Bickel ... 962,546
Air brake apparatus, J. W. Bingley ... 962,547
Air brake attachment for automatic systems, straight, W. R. Chandler ... 962,696
Air brake coupling, automatic, F. H. Roe ... 962,980
Air, device for equally dividing and distributing a current of, H. F. Rand ... 962,720
Airship, T. Korubrodt ... 962,964
Airship, A. R. Rieger ... 962,977
Alarm. See Fire alarm.
Album, H. Knopping ... 962,643
Amalgamating machine, J. S. Rayburn ... 962,466
Amalgamating riffle, E. S. Hoyt ... 963,005
Ammunition, primer for small arm, W. H. Buell ... 962,888
Animal jaw puller, E. B. Perrigo ... 962,782
Annealing furnaces, delivery apparatus for bottle, C. Brauer ... 962,811
Anvil attachment, E. Spreen ... 962,477
Anvil supporting base, E. Spreen ... 962,478
Asylum lock, A. Apps ... 962,875
Attrition mill, E. P. Alsted ... 962,807
Automobile, C. E. Cox ... 962,626
Automobile controller lever lock, F. C. Miller ... 962,448
Automobiles, musical attachment for, D. J. Young ... 963,018
Axle construction, rear, R. H. Gilbert ... 962,633
Baling press, J. W. Hobson ... 962,432
Bars on lathe for dressing, cutting, or working the same, suspension for, F. Girard ... 962,829
Barrel, knockdown, Brown & Kast ... 962,938
Bath tub, P. Musselman ... 962,970
Battery jars, machine for and process of forming linings for storage, A. J. Meier ... 962,714
Bearing, C. L. Fowle ... 962,629
Bearing, expansible, C. Van Middlesworth ... 962,602
Bell ringer, automatic, C. Aalborg ... 962,688
Belt, Foster & Stoddard ... 962,563
Berry box, folding, W. W. Wood ... 962,607
Binder, L. E. Heller ... 962,568
Binder, ball lock, sectional post, F. A. Bowen ... 962,416
Binder, loose leaf, W. C. Traber ... 962,868
Binder, temporary, J. Patterson ... 962,460
Binders, perforating attachment for loose leaf, J. J. Diehl ... 962,421
Bookbinders' appliance, G. D. Steere ... 962,867
Boring machine, taper, R. R. Kuss ... 962,848
Boring tool, O. B. Elder ... 963,022
Bottle capping machine, R. W. Wittemann ... 963,017
Bottle filling machine, B. Gallagher ... 962,564
Bottle stopper, non-refillable, W. R. Voss ... 962,681
Box. See Berry box.
Box bottoms or lids, manufacturing, Nice & McMichael ... 962,851
Bracket, F. B. Cook ... 962,494
Braider spool, F. Mossberg ... 962,715
Braiding machine carrier, Parks & Wardwell ... 962,522
Breaking and scutching machine, J. W. Poindexter ... 962,783
Brick handling machine, R. C. Penfield ... 962,584
Brush, revolving upholsterer's, D. R. Johnson ... 962,433
Bucket, bottom dumping, G. L. Stuebner ... 962,930
Buffer, swinging, A. Christianson ... 962,818
Building block, L. Phillips ... 962,463
Burner, G. J. McPherson ... 962,971
Calculator, H. L. Lerner ... 962,441
Calender rolls, safety device for, W. Jameson ... 962,572
Calipers, micrometer attachment for machinists, J. H. Pember ... 962,583
Camera attachment, C. W. Kaufmann ... 962,844
Can lock, milk, D. J. Thayer ... 962,801
Can, receptacle, garbage, T. F. Bolger ... 962,887
Cans, spring attachment for oil, W. B. King ... 962,902
Caponizing instrument, C. J. Pilling ... 962,586
Car and cart, dump, J. B. Shelton ... 962,593
Car, box, W. E. Fowler ... 962,425
Car, concrete, J. B. Quinn ... 962,465
Car hand brake, railway, R. T. Burdette ... 962,693
Car journal dust guard, J. F. Thomas ... 962,480
Car retarder or check, R. M. Lindsay ... 962,967
Car stop, automatic, W. M. Hamilton ... 962,832
Car, tank, W. M. Kriekbaum ... 963,025
Car ventilator, F. W. Simson ... 962,476
Car wheel, W. McConway ... 962,456
Carburetor, H. A. Miller ... 962,649
Carburetor, P. P. Sanders ... 962,860
Casing, protective, B. Volkmar ... 962,680
Caster holder, H. D. Penney ... 962,461
Cattle guard, Dement & Crawford ... 962,554
Celluloid composition, J. W. Aylsworth ... 962,877
Cellulose structures, manufacturing, R. Linkmeyer ... 962,769
Chain grate furnace, A. W. Bends ... 962,734
Chair fan attachment, rocking, D. Billsits ... 962,808
Chair parts, fastening device for, M. D. Bell ... 962,613
Chuck, drill, E. E. Cogswell ... 962,746
Churn, W. A. Decker ... 962,947
Cigar cutter, E. Walker ... 962,481
Clamp. See adjustable clamp.
Clamping device, F. Gerth ... 962,566
Closet connection, F. W. Carlson ... 962,621
Clutch, H. A. Hancock ... 962,567
Coat hanger, R. E. Macintosh ... 962,513
Coffin case, metallic, J. H. Schlafly ... 962,590
Coin controlled apparatus, I. Robbins ... 962,670
Collapsible tub, J. D. Green ... 962,554
Collar, E. J. Quigley ... 962,665
Collars, reinforcing and supporting device for flexible, D. Marinsky ... 962,514
Colter fastening, J. W. Hiett ... 962,508
Combination furnace, T. Holland ... 963,024
Compasses, J. Diraca ... 962,702
Compressor, H. D. Shelton ... 962,592
Concrete construction, J. E. Conzelman ... 962,698
Concrete construction, sectional mold for, F. S. Farrar ... 962,560
Concrete reinforcement, R. S. Allyn ... 962,488
Concrete, sheeting pile of reinforced, S. L. Ravier ... 962,784
Condenser, G. M. Harden ... 962,427
Conductor, steam, P. H. Sellers ... 962,789
Conduit, flexible, G. A. Lutz ... 962,772
Conduits, elbow for, G. A. Lutz ... 962,773, 962,774
Confections, storage receptacle for frozen, C. W. Reynolds ... 962,527
Controller, electropneumatically operated, J. Mahoney ... 962,713
Copy holder, S. Steinmeyer ... 962,988
Corner fastening, R. R. Rockwell ... 962,528
Cornet mouthpiece, L. E. Taylor ... 962,479
Corset, J. M. Liebermann ... 963,026
Couch and bed, combined, D. T. Owen ... 962,580
Couch, convertible, Dyett & Hulpian ... 962,948
Coupling device, J. H. Beltz ... 962,733
Coupling hook, auxiliary, D. T. Goodman ... 962,634
Coupler, car, receptacle, H. Jacobson ... 962,898
Cover, receptable, B. J. Levin ... 962,710
Cradle, folding, A. W. H. Raettig ... 962,587
Crank, adjustable, T. S. White ... 963,016
Crate, box, etc., collapsible, Coffey & Bowen ... 962,745
Crate rack, bottle, Robinson & Neale ... 962,671
Cream float locking device, M. S. Tarkington ... 962,799
Crib structure, W. M. & J. P. Lawyer ... 962,707
Crushing roll, T. A. Edison ... 962,[illegible]
Crushing rolls, T. A. Edison ... 962,823
Cultivator, W. F. Nielsen ... 962,520
Cultivator, J. L. Woolard ... 962,806
Cultivator shovel, D. Katt ... 962,434
Cultivator shovel moldboard, W. M. Medcalf ... 962,909
Currycomb, A. Rahn ... 962,666, 962,667
Curtain fastener, L. C. Bailey ... 962,879
Curtain pole, J. Schopen ... 962,787
Curve, adjustable irregular, A. Gasparich ... 962,890
Cuspidor, non-spilling, G. Pastors ... 962,852
Cut-out and metering apparatus, service, T. E. Murray ... 962,455
Cutter. See Cigar cutter.
Cycle shock absorber, motor, E. Loudenclos ... 962,443
Davenport and bed, combined, Hulse & Schramm ... 962,761
Deflecting bars, adjustable stand for, E. C. Larry ... 962,849
Desk pad, A. Swarin ... 962,798
Diffusion apparatus, J. Stewart ... 962,725
Diffusion process, J. Stewart ... 962,597
Dish cleaner, G. Jackie ... 962,763
Display hanger for curtains, etc., C. E. Perkins ... 962,855
Distillation, wood, H. Rasche ... 962,668
Ditching machine, S. De Force ... 963,021
Door check and closer, J. C. Regan ... 962,916
Door hanger, A. Wagner ... 962,558
Door lock, A. Carpenter ... 962,997
Draft rigging, friction, C. A. Tower ... 962,993
Drawer guide, A. Elmborg ... 962,502
Drawing board attachment, A. H. Maranda ... 962,776
Dredge cutter head, hydraulic, W. T. Weaver ... 962,540
Drill, I. Waters ... 962,994
Drill press and boring machine, combined, J. T. Sherod ... 962,474
Drill spindle driving mechanism, H. Allen ... 962,690
Drilling machine, automatic, F. H. Pierpont ... 962,464
Drying machine, A. M. Schreuder ... 962,865
Dust collector, W. Gyer ... 962,737
Easel, W. E. Trum ... 962,932
Easel or the like, F. J. Kristofek ... 962,963
Egg tester, G. Arthur ... 962,876
Electric apparatus, vapor, J. T. H. Dempster ... 962,497
Electric circuits, time limit protective device for, H. W. Cheney ... 962,817
Electric connector terminal, E. ... 962,921
Electric furnace for metallurgical purposes, H. F. D. Schwahn ... 962,532
Electric machine, dynamo, M. Walker ... 962,683
Electric switch, pendent, F. E. Seeley ... 962,923
Electrical apparatus, C. Aalborg ... 962,689
Electrical receiving apparatus, J. M. Boyle ... 962,417
Electrical receptacle and rosette, L. J. Castonguay ... 962,816
Electroplating pipes, etc., apparatus for, D. H. Murphy ... 962,655
Elevator, J. H. Taylor ... 962,991
Engine. See Fluid pressure impact engine.
Engine lubricating apparatus, steam, E. Ryan ... 962,859
Engine starting apparatus, gasoline, V. Morrill ... 962,653
Engine wheels, extension rim for traction, T. Schele ... 962,672
Engines, filler or junk plate for the crank cases of explosive, G. W. Marble ... 962,445
Engraving machine, R. H. Kirk ... 962,439
Engraving machine, H. F. Whedon ... 962,686
Envelope machine, M. A. Stewart ... 962,927
Etching printing plates, apparatus for, W. J. Holt ... 962,839
Evaporator heater, G. H. Grimm ... 962,830
Explosive liquids, draw-off device for, L. Kessler ... 962,846
Eyeglass temple, L. H. Broome ... 962,549
Eyeglasses, C. Alter ... 962,873
Eyelet and rivet feeding device, M. A. Stewart ... 962,928
Feed bag, A. Kannenberg ... 962,708
Feed regulator, water, W. H. Bice ... 962,735, 963,019
Feed trough, adjustable, F. C. Griner ... 962,635
Fence construction, post and wire, P. F. Frost ... 962,632
Fence post, H. S. Perry ... 962,523
Fence post, S. W. Loomis ... 962,905
Fence post brace, W. O. Freeland ... 962,950
Fender, F. Gautzsch, Jr. ... 962,754
Filaments, apparatus for the continuous manufacture of, Michaud & Deiasson ... 962,910
Filing cabinet, H. J. Davis ... 962,749
Fire alarm, M. V. Crawford ... 962,552
Fire alarm system, R. Couture ... 962,625
Fire cracker holder, M. Nielsen ... 962,972
Firearm, T. C. Johnson ... 962,764
Firearm, cleaning rod, J. H. Blair ... 962,883
Firearms, sliding operating handle for, F. F. Burton ... 962,889
Fishing signal, J. L. Dibbles ... 962,420
Flat iron, electrically heated, G. E. Stevens ... 962,989
Floor scraper, F. Stephens ... 962,926
Fluid generators, construction of motive, F. S. McKibben ... 962,458
Fluid pressure impact engine, J. Kincaid ... 962,511
Fluid substances, desiccating, W. S. Osborne ... 962,781
Flush tank, K. Kohler ... 962,765
Flying machine, S. Montgomery ... 962,652
Footwear mold, M. C. Clark ... 962,697
Forging machine, metal, J. Fielding ... 962,705
Form, garment, C. H. Posner ... 962,915
Fuel press, D. C. McCan ... 962,716
Funnel indicator, C. F. Sendall ... 962,674
Furnace, H. Strand ... 962,677
Furnace regulator, thermo electric, J. H. Bobbitt ... 962,884
Furniture fastener, T. J. Call ... 962,939
Gage. See Raker gage.
Garbage cans, etc., stand for, W. S. Amberson ... 962,874
Gasoline rake, A. E. Engstrom ... 962,559
Garment support, extensible, S. Himmel ... 962,837
Gas and liquids, automatic shut-off system for, C. D. Miller ... 962,648
Gas burner, G. Helps ... 962,834
Gas engine, F. O. Kilgore ... 962,437
Gas engine, S. J. Webb ... 962,995
Gas machines, constant supply device for vaporizing fuel, J. F. Barker, Jr. ... 962,611
Gas pressure regulator, W. A. Fenton ... 962,503
Gas producers, vaporizer for, B. M. Aslakson ... 962,610
Gas regulator, G. A. Hont ... 962,959
Gases, cooling and liquefying, G. Hildebrandt ... 962,836
Gaseous fuel burner, H. & C. Schneider ... 962,472
Glass, method of and apparatus for drawing, T. Spillane ... 962,925
Glassware fire polishing apparatus, A. J. Sanford ... 962,863
Glassware fire polishing burner, A. J. Sanford ... 962,861, 962,862
Glove, base ball, C. M. King ... 962,438
Gluing machine, J. Buffelen ... 962,619
Gold from river beds, means for extracting, J. H. Batten ... 962,612
Gold saving apparatus, W. H. Hackney ... 962,636
Grading, digging, and leveling machine, combined, D. E. Graves ... 962,756
Grain leveling device, Turner & Polbeck ... 962,901
Grain shocker, J. McCormick ... 952,656
Gramophone, Haye & Wessels ... 962,833
Gramophone, multiplex, H. E. Markle ... 962,446
Grate bar, A. Wilderspin ... 962,805
Grinding or reducing alfalfa to meal, mill or machine for, J. Wyss ... 962,543
Gun holder, S. Sobo ... 962,589
Gun, take down, T. C. Johnson ... 962,899
Hammer drills, valve for, V. J. O'Brien ... 962,717
Hammer, electric, B. M. Dutton ... 962,499
Hammock support, I. E. Palmer ... 962,521
Harness for controlling animals, Byrd & Treadway ... 962,890
Hartshorne attachment, A. J. Olson ... 962,579
Harrow, combination, J. L. Buckingham ... 962,742
Harvester tedder attachment, Oliphant & Ring ... 962,662
Harvesters, excavating mechanism for beet, H. F. Barber ... 962,880
Hat pin, W. N. Seibert ... 962,987
Hay press, portable, Dolan & Aylward ... 962,555
Head lighting device, S. Roman ... 962,858
Headlight, locomotive, M. A. Ross ... 962,469
Heater, C. C. Schaefer ... 962,864
Heating device, regulating, H. C. Mallory ... 963,007
Heating system, steam, J. Collis ... 962,550
Heating unit, electric, H. M. Smith ... 962,793
Hinge, spring door, H. K. Hansen ... 962,426
Hog ringer and tool, combination, W. G. Robinson ... 962,979
Hoisting mechanism, G. W. Murray ... 962,779
Hoisting plants, device for regulating the feeding of power in, J. Iversen ... 962,762
Hook. See Coupling hook.
Horn, sound, A. G. Kaufman ... 962,574
Horse detacher, E. P. Copenhaver ... 962,942
Horse, folding extensible, W. Pence ... 962,976
Horse holder and releaser, multiple, T. C. H. Wedge ... 962,804
Horseshoe, M. D. Brillhart ... 962,812
Horseshoes, non-slippable attachment for, A. J. Sangster ... 962,471
Hydraulic motor, P. T. Coffield ... 962,623
Hydrocarbon burner, I. L. Owens ... 963,010
Incubator, J. M. Sherman ... 962,594
Indenting machine, W. B. Keighley ... 962,845
Inhaler, I. Buceeri ... 962,617
Ink well, H. Malick ... 962,968
Insect destroyer, I. P. Farrington ... 962,561
Insect destroyer, T. R. Wallis ... 962,869
Insulating bushing, C. H. Thordarson ... 962,526
Ironing machine, H. Price ... 962,525
Jack, O. Greenstran ... 962,506
Jig, F. L. Buchanan ... 962,618
Journal box for rock shafts, adjustable, J. I. Mengis ... 962,447
Key, F. C. Eckert ... 962,558
Key ring, A. Bippart ... 962,882
Lactalbumin, making a neutral sodium salt of, Fischer & Bergel ... 962,753
Ladder, step, E. Bentley ... 962,881
Lamp, arc, T. J. Anderson ... 962,692
Lamp bracket, adjustable, R. G. Dethl ... 963,000
Lamp, electric arc, H. Beck ... 962,732
Lamp, incandescent electric, A. F. F. Stodd ... 962,795
Lamp receptacle or socket, electric, W. S. Ryan ... 962,589
Lamp system, incandescent, Y. Kawasaki ... 962,435
Lantern, signal, A. H. Handlan, Jr. ... 962,758
Last jack, C. C. Cole ... 962,747
Latch, rim, P. Seisler ... 963,012
Lavatory, J. H. Danver ... 962,892
Lawn trimming shovel, J. Reichert ... 962,785
Ledger, loose leaf, C. H. Gardner ... 962,895
Leuco dietyyigalloeyanin, W. Lommel ... 962,712
Leveling device, universal, G. A. Rhodes ... 962,467
Lever, uncoupling, W. P. Murphy ... 962,912
Lightning arresting apparatus, T. M. Stevens ... 962,536
Liquid cooling device, D. H. Moore ... 963,009
Liquid fuel burner, F. S. McKibben ... 962,457
Lock. See Asylum lock.
Lock, P. Ziron ... 962,486
Lock, J. Sipos ... 962,792
Loom picker check, S. Toyoda ... 962,802
Looms, filling feeder or magazine for automatic, N. Paquette ... 962,581
Low quad molds, control mechanism for, Bancroft & Indahl ... 962,412
Lubricating means for axles, bearings, and the like, W. J. Greening ... 962,955
Mail catching and delivering device, A. J. Hughes ... 962,571
Mail chute, F. E. Anderson ... 962,689
Mailing device, coin, A. E. Hall ... 962,978
Massage apparatus, H. C. Karpenstein ... 962,901
Match holder, pocket, D. L. Block ... 962,810
Mattress, wire, C. J. Witzel, reissue ... 13,125
Measuring apparatus, bootmakers', W. Church ... 962,744
Measuring device, automatic liquid, H. Morris ... 962,911
Measuring instrument, electric, H. D. Hickok ... 962,759
Meat and fruit press, E. Walker ... 962,603
Metal cutting machine, W. Ross ... 962,530
Mine ventilating apparatus, W. Dunn ... 963,002
Mitt, base ball, C. M. King ... 963,006
Mold drying apparatus, J. C. Davis ... 962,553
Motor, N. Lombard ... 962,711
Motor control, H. Heymann ... 962,835
Motor starting device, electric, Plank & Finney ... 962,856
Mower, lawn, J. H. Auble ... 962,407
Mower, lawn, S. T. Nelson ... 962,780
Music spool, P. Weiu ... 962,685
Musical instrument, coin controlled pneumatically operated, Shannon & Garnett ... 962,534

Musical instruments and music rolls therefor, controlling mechanism for self-playing, T. B. Powers, reissue 13,124
Musical instruments, automatic winding attachment for mechanical, E. E. Welte 962,871
Nest and brooder, combined, W. H. Parker 962,459
Night lock, W. H. Taylor 962,992
Nozzle, spray, L. W. Cushman 962,946
Nut lock, W. T. Payne 962,582
Nut lock, B. D. Kemp 962,642
Nut splitting and bolt nipping tool, J. Whisler 962,483
Obstetrical instrument, extension, L. Gosborn 962,952
Oil, apparatus for saturating the ground with, J. E. Ward 962,728
Oil burner, R. C. Casad 962,695
Oils, treatment of mineral and vegetable, Hood & Salamon 962,840, 962,841
Order slip, manifolding, G. E. Morton 962,451
Ore concentration, H. L. Sulman et al 962,678
Ore concentrator, S. R. Swain 962,999
Ore, mineral, and coal breaker, I. & H. K. Christ 962,998
Ore separating or concentrating machine, W. R. Lins 962,575
Oven doors against their seats, device for pressing, P. Riecke 962,669
Overshoe retainer, Harrold & Thanssen 962,428
Packing for elevators, plunger, J. C. Phelps 962,585
Packing ring, C. E. Brown 962,820
Pad. See Desk pad.
Paper bag holder, H. L. Snyder 962,676
Paper coating and sizing composition and process, H. V. Dunham 962,498
Paper, crapling, A. & J. Funke 962,505
Paper handling machine controller, H. C. La Batt 962,440
Paper holder and cutter, roll, H. B. Wallace 962,684
Pen, fountain, R. N. Saha 962,982
Pen, reservoir, R. Young 962,485
Penholder, J. Schwartz 962,986
Perfume tablet, soluble, R. W. Whitlatch 962,872
Phonograph record, composition for, J. W. Aylsworth 962,878
Phonograph record cylinders, carton for, Durand & Seeley 962,821
Photographic emulsion, Y. Schwartz 962,788
Photographic pictures, preparing, B. Widmann 962,484
Piano, L. M. Cook 962,748
Pianos, tempo controller for automatic, A. H. Stuart 962,537
Pianos, top stick for grand, P. Weber 962,605
Pipe, removing scale from, H. A. F. Petersen 962,402
Piston ring, J. Stoddard 962,599
Plank, extension, C. C. Andersen 962,601
Pliers, nippers, and similar tool, W. A. Bernard 962,414
Plow attachment, L. Dettrick 962,893
Plow, breaking, J. W. Majek 962,646
Plow harrow attachment, sulky, I. S. De Witt 962,701
Plow, mole, A. G. Hermanson 962,957
Pneumatic cleaner, F. H. Hirth 962,509
Pneumatic despatch tube apparatus, C. F. Stoddard 962,797
Pneumatic despatch tube apparatus, A. W. Pearsall 962,853, 962,854
Pneumatic despatch tube apparatus carrier, C. F. Stoddard 962,796
Poisoning product, animal, Boldman & Dyas 962,880
Poke, animal, J. W. Griffin 962,507
Post, W. T. Hicks 963,004
Post mold, W. T. Hicks 962,760
Potato bug exterminator, S. W. Reed 963,011
Power transmitting device, H. W. Hunt 962,842
Pressing iron stands, shoe for, F. E. Emery 962,894
Printing machine, E. M. Wildey 962,542
Printing machine, line, N. H. Brown 962,741
Printing on rubber footwear, machine for, J. W. Moore 962,515
Printing press self feeder, Sgal & Schwanda 962,806
Printing presses, cylinder driving mechanism for, R. T. Johnston 962,962
Prints, making multicolor, V. Peterson 962,718
Projectile, G. E. Wells 962,482
Projection apparatus, A. H. F. Perl 962,664
Puller. See Animal jaw puller.
Pulley, C. A. Brimley 962,548
Pump, J. E. Naughtin 962,518
Pump governor, W. H. Bice 962,736
Pump, steam, J. March 962,906
Punch, railway ticket, H. E. Palmer 962,913
Rail and joint therefor, Brill & Thompson 962,740
Rail drilling machine, Place & Jenkins 962,914
Rail joint, R. Burgunder 962,813
Rail joint, J. W. & E. J. Enright 962,824
Rail joint support, G. G. Floyd 962,424
Rail spike, Limberg & Koelling 963,027
Rail support, three tie, G. G. Floyd 962,423
Railway bonding system, electric, G. H. Lindsey 962,906
Railway switch, automatic, C. E. Brandfass 962,739
Railway tie, Randall & Hoeltzel 962,588
Railway tie, Martin & Katzer 962,908
Railway tie, metallic, Wilson & McDermott 962,996
Raisin stemmer, W. C. Anderson 962,669
Rake, J. B. Menzl 962,576
Raker gage and jointer, S. C. Miles 962,969
Razor holder or frame, safety, W. Schmidt 962,531
Razor honing apparatus, L. Alfano 962,935
Receptacle for liquids, J. W. Kaufmann 962,641
Receptacle for medicines and the like, hanging, J. B. Smith 962,595
Receptacle, metallic, E. Ryall 962,670
Recording device, G. F. Card 962,492
Reel, F. Mossberg ..... 962,452 to 962,654
Refrigerating appliance, Emerson & Bishop 962,704
Refrigerator pail, L. I. Flood 962,504
Regenerative reverberatory furnace, F. A. Leas 962,644
Relief device, R. Conrader 962,551
Resilient wheel, A. H. Peloubet 962,975
Ring blanks and applying them to articles, machine for producing, J. J. Rigby 962,786
Rivet, E. B. Stimpson 962,794
Rope fastener, L. C. Sims 962,675
Rope jockey, F. Simon 962,475
Rotary engine, R. C. Leedham 962,850
Rotary steam engine, Schultz & Niland 962,984
Ruler and paper cutter, combined, F. A. Dibrell 963,001
Sack, C. L. Weatherwax 962,934
Sad iron, electric, H. G. Levy 962,768
Sample holder, C. M. McLeod 962,658
Sash weight, T. Holland 962,838
Sash, window, J. V. Edwards 962,501
Sash, window, F. M. Matthews 962,647
Saw, J. Sigoloff 962,535
Saw handle, W. S. Locke 962,904
Schleroscope, A. F. Shore 962,790
Scow, C. E. Fowler 962,706
Scythe, V. P. Herbold 962,638
Sea power generator, R. M. Mobius 962,651
Seal lock, C. W. Gill 962,827
Seat. See Window seat.
Seed linter, cotton, H. E. Sessions 962,722
Semaphore mechanism, W. K. Howe 962,960
Sewage disposal plant, M. J. Wiest 962,606
Sewing machine, L. Onderdonk 962,974
Sewing machine attachment, G. O. Beasley 962,731
Sewing machine, drop head, S. A. Davis 962,700
Sewing machine, hemstitch, L. Onderdonk 962,973
Shade holder coupling, E. F. Pierce 962,524
Shaft reversing mechanism, J. D. Mooney 962,450
Shaping machine, duplicate, O. Jensen 962,573
Sheet iron boxes and other tinned articles to render the same suitable for being dethinned, cleaning old tinned, Goldschmidt & Weber, reissue 13,123
Shell or lift van, collapsible, F. F. Hedden 962,429
Shirt, sweat, J. W. Jordan 962,900
Shoe quarter, lining, pull strap, and extension double backstay, combination, J. Mitchell 962,650
Show case, A. Anderson 962544
Show case, Marsh & Heiss 962,777
Show case, H. C. Wallace 962,933
Shuttles, device for preventing rebound of, Cote & Snow 962,495
Sifter, ash, C. F. Nolte 962,661
Sign, J. M. Francis 962,630
Sign, J. C. Smith 962,724
Sign, illuminated, Kellner & Edwards 962,436
Sign supporting attachment, J. J. Kegler 962,963
Signaling device, Wohl & Hertzberg 962,687
Silk holder, darning, J. B. Eiseman 962,949
Singeing textile fabrics, device for, G. Gin 962,828
Sink stopple, M. S. Hufschmidt 962,570
Siphon, E. C. Cook 962,624

Wood-working Machinery



For ripping, cross-cutting, mittering, grooving, boring, scroll-sawing edge moulding, mortising; for working wood in any manner. Send for catalogue *A*.
The Seneca Falls M'f'g Co.
695 Water St., Seneca Falls, N. Y.

Engine and Foot Lathes
MACHINE SHOP OUTFITS, TOOLS AND SUPPLIES. BEST MATERIALS. BEST WORKMANSHIP. CATALOGUE FREE
SEBASTIAN LATHE CO., 120 Culvert St. Cincinnati, O.

JUST PUBLISHED
VEHICLES OF THE AIR
By V. LOUGHEED
A Popular Exposition of Modern Aeronautics with Working Drawings. The most complete book published on aerial navigation. 478 pages, 6¾ x 9¾ inches, 270 illustrations, including working drawings of machines and parts. Price $2.75 postpaid. Send for a descriptive circular.
MUNN & COMPANY, Inc., 361 Broadway, New York City

GINSENG Culture is the "Only Way" to make Big Money on LITTLE CAPITAL. One acre is worth $25,000, and yields more Revenue than a 100-acre farm with much less work and worry. Let me show you how to increase your annual income $500 to $5,000, and live in ease and comfort. Write now.
T. H. SUTTON, 780 Sherwood Avenue, Louisville, Ky.

WORK SHOPS
of Wood and Metal Workers, without steam power, equipped with
BARNES' FOOT POWER MACHINERY
allow lower bids on jobs, and give greater profit on the work. Machines sent on trial if desired. *Catalog Free.*
W. F. & JOHN BARNES CO.
Established 1872.
1999 RUBY ST. ROCKFORD, ILL.

Learn Watchmaking
We teach it thoroughly in as many months as it formerly took years. Does away with tedious apprenticeship. Money earned while studying. Positions secured. Easy terms. Send for catalog.
ST. LOUIS WATCHMAKING SCHOOL, St. Louis, Mo.

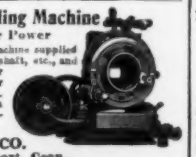
This Pump Requires No Attention
The ideal system of supplying running water for use in suburban homes or on farms, is a
Niagara Hydraulic Ram
Write for catalog AA and guaranteed estimate.
Niagara Hydraulic Engine Co., 140 Nassau St., N. Y.
Factory, Chester, Pa.

BABBITT METALS.—SIX IMPORTANT formulas. SCIENTIFIC AMERICAN SUPPLEMENT 1123. Price 10 cents. For sale by Munn & Co., Inc., and all newsdealers. Send for catalogue.

DO YOU USE GRINDSTONES?

If so we can supply you. All sizes **mounted** and **unmounted**, always kept in stock. Remember, we make a specialty of selecting stones for all special purposes. *Send for catalogue "L."*
The CLEVELAND STONE CO.
6th Floor, Hickox Bldg., Cleveland, O.

THE INTERNAL WORK OF THE Wind. By S. P. LANGLEY. A painstaking discussion by the leading authority on Aerodynamics, of a subject of value to all interested in airships. SCIENTIFIC AMERICAN SUPPLEMENTS 946 and 947. Price 10 cents each, by mail. Munn & Co., Inc., 361 Broadway, New York City, and all newsdealers.

Pipe Cutting and Threading Machine
For Either Hand or Power

This machine is the regular hand machine supplied with a power base, pinion, countershaft, etc., and can be worked as an ordinary power machine or taken from its base for use as a hand machine. Pipe ⅛ in. to 15 in. diameter handled easily in small room. Illustrated catalogue—price list free on application.
THE CURTIS & CURTIS CO.
6 Garden Street, Bridgeport, Conn.

4 H.P STATIONARY GASOLINE ENGINE $76
For Farmwork, Irrigation or Pumping, Factory use and Electric Lighting.
3 to 20 h. p.—perfectly governed—guaranteed by a responsible firm. Write for particulars
GRAY MOTOR CO. 121 Leib St., DETROIT, MICH

Go to Saratoga and Lake George
Best Reached by "The D. & H."
Enjoy a different—a better vacation this Summer. Make it your opportunity to see Saratoga and Lake George—where pleasure, recreation, rest and health abound.
Experience the hundred and one unique delights afforded by these famous Summer Resorts. Nothing like them in the world. The best of boating, bathing, fishing, golfing, mooning—every form of sport you might desire. Breathe the pure, invigorating mountain air. Drink the crystal water bubbling from the world-famed mineral spring.
Send today for a copy of this 360 page book
"A SUMMER PARADISE."
Contains photographs and description of the country through which the D. & H. passes; gives locations and rates of hotels and farm houses offering accommodations.
Send 6 cents to cover postage.
THE DELAWARE & HUDSON CO.
A. A. HEARD, G. P. A., Albany, N. Y.
Information Bureau, 1354 Broadway, N. Y.

Instructive Books

AGRICULTURE.—The New Agriculture. By T. Byard Collins. 12mo.; 374 pages; 106 illustrations. $2.00
A popular outline of the many changes which are revolutionizing the methods of farming, and the habits of farm life. It is one of the most practical treatises on the subject which has ever been issued.

ALCOHOL.—Industrial Alcohol. Its Manufacture and Uses. By John K. Brachvogel. 8vo.; 528 pages; 107 illustrations. $4.00
A practical treatise based on Dr. Max Maercker's "Introduction to Distillation," as revised by Drs. Delbruck and Lange, comprising raw material, mashing and yeast preparation, fermentation, distillation, rectification and purification of alcohol, alcoholometry, the value and significance of a tax-free alcohol, methods of denaturing, its utilization for light, heat, and power production, a statistical review, and the United States law.

AMATEUR MECHANICS.—Home Mechanics for Amateurs. By George M. Hopkins. 12mo.; 370 pages; 326 illustrations. $1.50
This is a thoroughly practical book by the most noted amateur experimenter in America. It appeals to the boy as well as the more mature amateur. Holidays and evenings can be profitably occupied by making useful articles for the home or in the building of small engines or motors or scientific instruments.

COMPRESSED AIR.—Compressed Air. Its Production, Uses, and Application. By Gardner D. Hiscox. 8vo.; 665 pages; 540 illustrations. $5.00
The most complete book on this subject. It treats on its physical and operative properties, and is written by an expert. Taken as a whole it might be called an encyclopedia of compressed air.

DIES.—Their Construction and Use for the Modern Working of Sheet Metals. By Joseph V. Woodworth. 8vo.; 384 pages; 505 illustrations. $3.00
A most useful book, and one which should be in the hands of all engaged in the press working of metals; treating on the designing, constructing, and use of tools, fixtures and devices, together with the manner in which they should be used in the power press, for the cheap and rapid production of sheet metal articles.

ELECTRICITY.—Electrician's Handy Book. By T. O'Conor Sloane. 761 pages; 556 illustrations. Handsomely bound in red leather, pocket-book style. $3.50
This work is intended for the practising electrician who has to make things go. Although the principles of electricity and magnetism are treated, the greater part of the book is devoted to practical handling of machinery, details of construction, and computations such as will be encountered in every-day practice.

GAS ENGINES.—Modern Gas Engines and Producer Gas Plants. By R. E. Mathot. 8vo.; 314 pages; 152 illustrations. $2.50
A practical treatise setting forth the principles of gas engines and producer design, the selection and installation of an engine, conditions of perfect operation, producer gas engines and their possibilities, the care of gas engines and producer gas plants, with a chapter on volatile hydrocarbon and oil engines.

GAS ENGINES.—Gas Engine Construction. By H. V. A. Parsell and A. J. Weed. 8vo.; 304 pages; 145 illustrations. $2.50
A practical treatise describing the theory and principles of the action of gas engines of various types, and the design and construction of a half-horse-power gas engine, with illustrations of the work in actual progress, together with the dimensioned working drawings giving clearly the sizes of the various details.

MECHANICAL MOVEMENTS.—Mechanical Movements, Powers, and Devices. By Gardner D. Hiscox. 8vo.; 403 pages; 1,800 illustrations. $2.50
This is a collection of different mechanical motions and appliances, accompanied by appropriate text, making it a book of great value to the inventor, the draftsman, and to all readers with mechanical tastes.

MECHANICAL APPLIANCES.—Mechanical Appliances, Mechanical Movements, and Novelties of Construction. By Gardner D. Hiscox. 8vo.; 396 pages; 970 illustrations. $3.50
This book, while complete in itself, is in fact a continuation of the author's "Mechanical Movements, Powers, and Devices." The author presents to the reader information regarding nearly all conceivable devices for producing motion or accomplishing mechanical results.
SPECIAL OFFER: These two volumes sell for $3 each, but when they are ordered at one time from us, we send them prepaid to any address in the world, on receipt of $4.

PATENTS.—Practical Pointers for Patentees. By F. A. Cresee. 12mo.; 144 pages. $1.00
Containing valuable information and advice on the sale of patents and elucidation of the best methods employed by the most successful inventors in handling their inventions. It gives exactly that information and advice about handling patents that should be possessed by every inventor who would achieve success.

RECEIPTS.—The Scientific American Cyclopedia of Receipts, Notes and Queries. Edited by Albert A. Hopkins. Containing 15,000 selected formulas. 8vo.; 734 pages. Cloth, $5.00. Sheep, $6.00. Half morocco, ... $6.50
Over 15,000 selected receipts are here collected, nearly every branch of the useful arts being represented. The alphabetical arrangement with abundant cross references makes it an easy work to consult. It has been used with equal success by chemists, technologists, and those unfamiliar with the arts, and is a book which is useful in the laboratory, factory, or home.

TOOLS.—American Tool Making and Interchangeable Manufacturing. By Joseph V. Woodworth. 8vo.; 535 pages; 601 illustrations. $4.00
A complete practical treatise containing a valuable collection of drawings and descriptions of devices, the results of the author's own experience.

WIRING.—Electric Wiring, Diagrams and Switchboards. By Newton Harrison. 12mo.; 272 pages; 105 illustrations. $1.50
This work is a thoroughly practical treatise on electric wiring in all its branches, beginning with the simple circuit and working up to the practical every-day problems, all being presented in a simple and intelligent manner. It is in every respect a handy, well written, instructive, comprehensive volume on wiring for the wireman, foreman, contractor, or electrician.

Any of the above books will be sent postpaid on receipt of price.

MUNN & COMPANY, Inc.
Publishers 361 Broadway, New York

A GIANT STEAM EXCAVATOR.

(*Continued from page 24.*)

tended in a vertical position when the bucket is at the top of the bank, and the arrangement is such that the bucket in its upward movement is kept in constant contact with the surface of the slope, the telescopic arm accommodating itself in such a manner during this upward travel that the pressure at all times is uniform.

The excavator is provided with a heavy circular track on the engine frame, the roller path comprising permanent section bullhead rails. This track is of very stiff construction, as tilting or sinking of the apparatus must be provided against. The revolving carriage is fitted with several steel rollers with stout flanges on the outer side, so as to insure the rotating part maintaining a concentric position in regard to the lower frame. A central pillar is dispensed with by resort to horizontal thrust rollers.

The excavator is fitted with three separate sets of engines. One is non-reversing, and used for hoisting; the engagement is by means of a sliding pinion with the spur wheel actuating the winding drum which raises the bucket. A powerful foot brake for controling the lowering of the bucket when the engine is disconnected. The latter also drives the traveling mechanism through a clutch miter gear, the trains of gear connected to the road wheels being linked up with the former by means of a vertical shaft. All the wheels are driven, and the trains of gear are in duplicate with a worm motion in each set. This is especially advantageous, the worm gear always holding the machine rigidly in any position, without any liability of running back.

The other two operating engines are of the twin-cylinder steering type. In supplying power to the various parts by an independent engine enhanced efficiency is secured, where some motions have to be engaged and disengaged while in operation, and no system of clutches can compare either in the saving of time or the simplification of control with the three-engine system as here adopted.

The slewing engine is fitted with automatic reversing valves controlled by a single handle, so that the engine can be driven in either direction as desired. It is placed under the boiler, and slewing is effected through a set of gearing transmitting the power to a horizontal sprocket wheel, which engages with an endless chain attached to and surrounding the fixed carriage.

Similarly, the racking engine has automatic reversing valves and also self-locking mechanism, so that the arm can be held rigid in any desired position and controled by a single handle. This engine is housed forward in the engine frame, and the racking motion is carried out upon novel and effective lines. The winding drum is grooved to carry four stout wire ropes, in such a manner that when two are running out, the groove they occupied is being taken up by the other two ropes. The drum has a powerful forward and backward motion imparted to it by the engine. The ropes pass from one drum up the jib to a second drum at the fulcrum of the bucket arm, this barrel being not only similarly grooved to the one below and working in the same manner to keep the ropes in position, but also having plane surfaces on both sides on which the arm rolls. One pair of ropes from the main engine drum pass under this upper barrel and have their ends fixed to the top of the arm, while the other pair of ropes similarly pass under the upper barrel and are attached to a point low down on the arm. Consequently, by running the engine backward and forward the arm is caused to reciprocate. The arm cannot be displaced on the upper drum, as there is a yoke provided to prevent it. Experience has shown that this ingenious method of racking is far preferable to that ordinarily practised, at least in connection with excavators of large radius, as there is a complete elimination of vibration, while

(*Continued on page 38.*)

Classified Advertisements

Advertising in this column is 75 cents a line. No less than four nor more than 10 lines accepted. Count seven words to the line. All orders must be accompanied by a remittance. Further information sent on request.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. There is no charge for this service. **In every case it is necessary to give the number of the inquiry.** Where manufacturers do not respond promptly the inquiry may be repeated.

MUNN & CO., Inc.

BUSINESS OPPORTUNITIES.

100 PER CENT. profit selling the Lindsay soft inverted mantles; fit any inverted gasoline light. Steady customers in every town. Fine side line for salesmen. Vest pocket samples and prices on request. Lindsay Light Co., Dept. B, Chicago.

Inquiry No. 8918.—For manufacturers of "Wydt's Electro-Catalytic Sparking Plug."

ITALIAN.—Young man well versed in commerce, best American references, offers himself to an important firm which wishes to introduce on the Italian market its own products. Write A. Salvadori, Mercede 34, Rome, Italy.

Inquiry No. 8987.—Wanted, the manufacturers of the Van Winkle Woods & Sons, and the Weber power meters.

FOR SALE.

FOR SALE.—Interest or control in manufacturing business. Exceptional opportunity for manager or instrument maker. Control, Box 773, N. Y.

Inquiry No. 9014.—For manufacturers of machinery, supplies etc., to equip a small plant for the manufacture of iridium-tipped gold nib making for fountain pens.

35 H. P. CORLISS ENGINE, fine condition, can be seen running. For further information address Rees & Rees, 2-2 and 3-4 East 47th Street, New York.

Inquiry No. 9016.—Wanted, machinery necessary for an installation of a plant for refining salt by a modification of the Bessemer process.

PATENTS FOR SALE.

FOR SALE.—Outright or on royalty, an automatic lock for miners safety lamps. Simple, can not be picked. For particulars address Anson Hall, Johnstown, Pa.

Inquiry No. 9029.—Wanted, catalogues and all information on machinery for braiding straw in manufacturing straw hats.

FOR SALE.—Foreign patents. U. S. patent allowed, license. Valuable improvement in trunk, no trunk complete without. For particulars address, Joseph Popenhagen, 1342 W. Munroe Street, Chicago, Ill.

Inquiry No. 9038.—Wanted, the address of the Chapman Electric Purifying Co.

PARTNERS WANTED.

PATENT, useful for every home, rapid seller. Wanted, partner for Great Britain and Canada. Will accept royalty. You mean business, address Owner, Hampton Street, Rock Hill, South Carolina.

Inquiry No. 9060.—Wanted to buy machinery to manufacture seed corn racks.

TYPEWRITERS.

TYPEWRITERS.—Every make, each entirely rebuilt and refinished; guaranteed satisfactory or may be returned. Illustrated list free. Agents' discounts. Typewriter Clearing House Co., 57 Broadway, New York City.

Inquiry No. 9075.—Wanted, to buy small weather vanes, such as can be used as ornaments on lightning rod tops. Aluminum preferred.

LISTS OF MANUFACTURERS.

COMPLETE LISTS of manufacturers in all lines supplied at short notice at moderate rates. Small and special lists compiled to order at various prices. Estimates should be obtained in advance. Address Munn & Co., Inc., List Department, Box 773, New York.

Inquiry No. 9076.—Wanted, the address of parties in Canada who could make a safety razor.

SALE AND EXCHANGE.

A LIST OF 1,500 mining and consulting engineers on cards. A very valuable list for circularizing, etc. Price $15.00. Address Munn & Co., Inc., List Department, Box 773, New York.

Inquiry No. 9078.—Wanted, the address of manufacturers of sewer pipe, made of fiber and asphaltum, suitable for laboratory use.

Inquiry No. 9094.—Wanted address of The Thomas Arithometer Company, also Burkhart Arithometer Company.

Inquiry No. 9096.—Wanted, the address of manufacturers of spiral welded pipes, possessing great strength.

Inquiry No. 9097.—Wanted, address of makers of impulse water wheels.

Inquiry No. 9099.—Wanted, address of manufacturers of machinery for making wire cables.

Inquiry No. 9107.—Wanted addresses of manufacturers of small emery files (pieces of emery in the shape of a file).

Inquiry No. 9109.—Wanted addresses of the manufacturers of the Dion Desk Clock.

Inquiry No. 9113.—Wanted name and address of the manufacturers of the Russell Patent Automatic Ink Well.

Inquiry No. 9115.—Wanted a machine for making pen nibs, similar to Wm. Mitchell's G. & J. nibs and Waverly nibs.

Inquiry No. 9118.—Wanted, a muffler for a gasoline engine, built upon the principle of the Maxim silencer, recently brought out for use on rifles.

Inquiry No. 9120.—Wanted, the address of the Dies Fuel Feeder Co.

Inquiry No. 9134.—Wanted, a small hydraulic motor, capable of giving about one horse power with a water power of 35 lbs. per square inch.

Inquiry No. 9135.—Wanted, name and address of manufacturers of the Parshall Compressed Air Ice Machine.

Inquiry No. 9136.—Wanted, the name and address of a skunk raising farm.

Inquiry No. 9137.—Wanted, a device that will braid leather strips for horse whips.

Inquiry No. 9138.—Wanted, the address of manufacturers of machines capable of forming a number (12 or more) of pieces of paste about 35 mm. x 32 mm. x 6 mm., made of lead oxide and sulphuric acid, and placing them into a frame having a separate compartment for each piece, the space between each piece and the next being all round 4 mm. The process could be somewhat similar to biscuit making.

Inquiry No. 9140.—Wanted, manufacturers of disc records for gramaphones that use a sapphire point instead of a steel needle.

Inquiry No. 9143.—Wanted, name and address of the manufacturers of an air mattress.

Inquiry No. 9144.—Wanted, manufacturers of machinery for making soda water tubes, commonly known as straws.

Inquiry No. 9145.—Wanted, to buy machinery to load blasting caps or detonators.

Inquiry No. 9152.—Wanted, the address of the Graham Safety Lamp Filler and Ventilator.

Inquiry No. 9153.—Wanted, name and address of manufacturers of a knotless clothes line.

Inquiry No. 9155.—Wanted, the address of manufacturers of an electric milking machine.

Inquiry No. 9163.—Wanted, manufacturers of a cradle worked by clock work.

Inquiry No. 9166.—Wanted, the address of O. Schurmann Street Sweeper and C. H. Butler Contracting Co.

Inquiry No. 9167.—Wanted, the address of the German Quartz Co.

Inquiry No. 9168.—Wanted, the name of manufacturer making the Morse Eureka Spring Terminal, sometimes called spring clip.

Inquiry No. 9169.—Wanted, the address of the manufacturers of the Hornsby Akroid 80 H. P. Gas Engine.

Inquiry No. 9170.—Wanted, manufacturers of a movable apparatus for the distillation of wood stumps.

Inquiry No. 9172.—Wanted, the address of the Arnold Vacuum or Suction Cleaner.

Inquiry No. 9173.—Wanted, manufacturers of machinery for removing fibre (coir) from cocoanut husks.

Inquiry No. 9174.—Wanted, improved fabric suitable for airships. Lightness and breaking strain must be exceptional.

Inquiry No. 9175.—Wanted, manufacturers of a machine called Bezaco or Bisco, used in the manufacture of ostrich feathers.

Inquiry No. 9176.—Wanted, the address of E. R. Holmes Motor Company, manufacturers of a rotary aeronautic motor.

Inquiry No. 9177.—Wanted, the address of parties owning talc deposits.

(Continued from page 37.)

there is a welcome diminution in forward placed weight which must be doubly counterbalanced at the back.

The outer end of the main jib carries a large pulley 8 feet in diameter, which not only reduces wear and tear or injury upon the rope, but also appreciably improves the angle of pull of the rope in relation to the line of resistance formed by the bucket arm when the bucket is down, thereby materially increasing the digging.

The bucket is carried on trunnions in a fork at the outer end of the girder bucket arm, which is 50 feet in length. This bucket and its method of operation have many ingenious features, the patent gear enabling the bucket to be tilted to any angle in relation to the arm. The bucket is of three cubic yards capacity, and there is attached to its upper sides a heavy foothed segment engaging a toothed gear mechanism. This gearing is driven from a small reversing engine housed in the arm just above the fork in which the bucket is carried, and fed with steam from the main boiler through flexible hose. Control of this engine is effected from the driving platform by ropes, and it can be operated at will while the bucket is in operation. The engine and its gear also solve the question of tilting the bucket backward to discharge its contents in cars, so that the whole is shot into the vehicles and not spilled over the sides. The operation is as follows: The bucket arm is lowered until the bucket rests on the ground at the base of the bank, the arm being vertical. As the bucket is drawn up, the engineer makes sure that the bucket teeth dig into the bottom of the bank, and commences to cut. He then allows the arm to draw in as the machine digs until the bucket has traveled about half way up the slope. He then forces the bucket arm out again, so as to keep the bucket well pressed against the slope, at the same time tilting the bucket forward, through the small engine and gear in the muck-pole fork, so as to dig the teeth well into the bank, while the rear edge of the bucket is lifted clear, until it reaches the top of the bank. On gaining the top it can either be lifted a little higher and tilted backward, shooting the contents into cars on a track at the top of the bank, or it can be lowered and similarly emptied into cars on a track alongside the machine. The lowering is effected by the brake, the engine being disconnected.

The track of the machine, especially when working in soft ground, has to be well prepared, as the total weight of the excavator is some 70 tons. There being a large wheel base, the weight is well distributed, and the track comprises steel rails weighing 100 pounds per yard. As however it is only necessary to move the machine a few feet per day, owing to its range of action throughout the circle, the preparation of the track is not an elaborate or expensive undertaking. The machine is capable of cutting a railway cut 100 feet wide at the top by 30 feet at the

(Concluded on page 39.)

PARIS GARTERS

TRADE MARK REGISTERED

A Necessity with Knee Drawers

They fit so well, you forget they're there

25¢, 50¢ and $1.00 at your dealers, or sample pair from the makers.

A. STEIN & CO.

514 Center Ave. Chicago.

NO METAL can touch you

We Guarantee Your Tires

NO maker of an automobile is willing to let his name stand back of the tires he sells you on the car you buy.

No matter what facts concerning low cost of upkeep he can show you, *he does not include the tires.*

Yet tire trouble and tire expense is ninety-nine hundredths of all automobile trouble and upkeep.

Standard Tire Protectors

are the only practical solution of the tire question. With them you may come and go, day in and day out, without the least bit of anxiety. Your repair bills will take a sudden drop.

Sharp stones, glass or nails cannot penetrate our durable protectors—still they do not reduce the life of the tire nor effect its resiliency.

The Protectors slip over the tread surface of the tire and are held firmly in place by the natural inflation pressure. There are no metal fastenings. Sand, gravel or water cannot get in. Impossible for them to work off, and no creeping takes place.

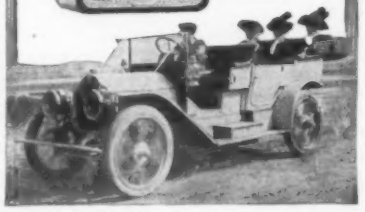
Made for any size tire or wheel.

Write today for our handsome booklet and see why "Standard Protectors do protect." Read our many genuine testimonials.

Standard Tire Protector Company

1109 S. Water St.

Saginaw, Mich.



Free Catalogue of Scientific and Technical Books Free

We have just issued a new edition of our Catalogue of Scientific and Technical Books, which contains 144 pages, and a copy will be mailed free to any address on application.

MUNN & CO., Inc., Publishers of Scientific American

361 Broadway, New York

Skating rink and merry-go-round, combined, Ancil & Bollet	962,608
Skid, W. A. Campbell	962,815
Sleigh, B. M. Wentworth	962,015
Smelting pyritic ores, Channing & Falding	963,020
Snow machine, C. Reynolds	962,917
Soap dispenser, C. E. Wade	962,682
Soldering chains, G. H. Benjamin	962,413
Soldering machine, can, J. Coyle	962,944
Soldering machine, can, D. P. Robinson	962,978
Solenoid operating mechanism, E. M. Hewlett	962,958
Sound reproducing machine, L. J. Gerson	962,565
Spades, auxiliary tool for use in connection with, E. M. Skinner	962,723
Spark plug, G. Walzel	962,604
Speed controller, J. T. Cowley	962,819
Speed gage, L. A. Casgrain	962,622
Spinning and other purposes, producing durable solutions for, R. Linkmeyer	962,770
Spittoons, apparatus for cleansing medical, Thieme & Glaser	962,931
Spray head, D. M. Liehrs	962,512
Spring. See Vehicle spring.	
Spring jack structure, H. J. Kusel	962,847
Stationery, M. I. Hufey	962,961
Steam engine, J. March	962,967
Steering knuckle, T. V. Buckwalter	962,491
Sterilizer, S. Blickman	962,869
Still, I. M. Lee	962,965
Stone, casting artificial, J. B. Simpson	962,924
Stone saw, J. R. Peirce	962,663
Stop and waste, compression, P. Mueller	962,516
Storage battery, C. F. Washburn	962,870
Stove, cook, W. L. Crumrine	962,496
Stove, gas, T. M. Dudgeon	962,752
Stove, heating, W. Heuermann	962,430
Straightening machine, J. P. Haga	962,831
Suction cleaner, portable hand operated, D. P. Moore	963,008
Swimming apparatus, W. H. Boregard	962,415
Switch bar adjusting device, J. E. Conley	962,698
Switch lock, P. F. Augenbraun	962,936
Switch operating mechanism, G. Flessa	962,562
Switch operating mechanism, K. Schmitt	962,673
Switch point throwing mechanism, S. Lochowicz	962,771
Switchboard construction, W. M. Scott	962,473
Syringe, P. J. McElroy	962,657
Syringe, portable fountain, A. L. Dawson	962,969
Table, P. C. Nihil	962,659
Table, G. Schryver	962,922
Tank heater cover, H. G. Miller	962,449
Taper and making same, seamless plated, R. G. Schutz	962,985
Telegraph receiver, printing, J. Burry	962,694
Telegraph repeaters, type carriage propelling mechanism for printing, G. S. Blitz	962,431
Telegraphy, I. Kitsee	962,769
Telephone system, R. C. Livingston	962,645
Telephone system, J. B. Taylor	962,800
Telescope, hinged double, R. Strambel	962,929
Telescope lens system, Galilean, M. von Rohr	962,920
Textile fabric, G. H. Smith	962,014
Tie plate, W. L. De Remer	962,750, 962,751
Tile manufacturing apparatus, W. T. Nicholls	962,519
Tire, automobile, G. F. & C. C. Annis	962,729
Tire carrier, C. F. Batt	962,730
Tire for vehicle wheels, solid, A. Mans	962,444
Tire plug, L. A. Bourquenez	962,815
Tire, pneumatic, W. B. Hartridge	962,897
Tire, wheel, T. Midgeley	962,778
Tires to vehicle wheels, means for securing, C. G. Cabanne	962,814
Tongue and groove cutter, dovetail, C. Bodmer	962,885
Torch, contractor's, A. F. Jenkins	962,640
Toy figure, flat, G. Nogck	962,578
Toy, flying, W. C. Capewell	962,743
Trace fastener, T. E. Ewer	962,422
Track channeler, electropneumatic, A. H. Gibson	962,755
Tray, jewelry, G. C. Rueckert	962,981
Tray, wash, L. L. Browne	962,419
Tread, wear resisting and non slipping, P. W. Pratt	962,719
Trick box, A. Jedel	962,843
Trolley switch, F. L. Sessions	962,533
Truck, car, J. C. Barber	962,937
Tub. See Bath tub.	
Twine holder, F. B. Shuman	962,791
Type and other machines, driving or transmission mechanism for, Bancroft & Indahl	962,408
Type bar and typographic form, F. H. Richards	962,857
Type machines, low quad mold for, Bancroft & Indahl	962,411
Type matrices, driving press for, Bancroft & Indahl	962,409
Type mold, low quad, Bancroft & Indahl	962,410
Typewriting machine, A. T. Brown	962,418
Typewriting machine, W. G. Dunham	962,556
Typewriting machine, G. A. Seib	962,591
Typewriting machine, R. H. Strother	962,600
Typewriting machine, A. J. Briggs	962,616
Typewriting machine, R. W. Uhlig	962,727
Umbrella, folding, O. E. Walton	962,539
Umbrella, folding, H. Helgerson	962,963
Valve, J. G. Nolen	962,660
Valve, Lacy & Williams	962,760
Valve, automatic pressure reduction, W. H. Bice	962,737
Valve gear, spring holder for, G. Graham	962,953
Valve, pressure retaining, H. F. Bickel	962,545
Vegetable cutter, J. P. Eckert	962,500
Vehicle auxiliary spring, J. Eckhard	962,703
Vehicle foot rest, H. D. Hansford	962,837
Vehicle lubricating means, motor, R. Huff	962,569
Vehicle spring, W. E. Eastman	962,557
Vehicle top bow holder, S. T. Allen	962,487
Vending machine, cigar, Evans & Marshall	962,825
Vending machine, merchandise, H. E. Hunter	962,639
Ventilator. See Car ventilator.	
Vibration indicator, B. Volkmar	962,679
Vise, R. J. Schlosser	962,983
Wagon brake, C. D. Linton	962,442
Wagon brake, H. M. Mahan	962,775
Walls, making collapsible and expansible corrugated, W. M. Fulton	962,951
Washboard, C. P. St. John	962,598
Washboard attachment, J. R. Casey	962,891
Washing and conveying apparatus, combined, A. L. Duncan	962,628
Washing machine, H. S. Judd	962,510
Washing machine, J. Vierling	962,803
Washing machine, laundry, E. Probst	962,526
Waste and overflow, combined, H. & P. Mueller	962,577
Water closet connection, J. J. Cosgrove	962,943
Water closet ventilating device, A. A. & A. J. Bruder	962,490
Water cooler, A. N. Rose	962,529
Water heater, portable, Churchill & Risk	962,941
Water tube boiler, S. C. Munoz	962,454
Weather strip, metal, P. L. Hedberg	963,023
Weeder, R. M. Chambers	962,940
Weighing, bagging, and packing apparatus, H. Richardson	962,918
Weighing machine, H. Richardson	962,919
Weight hanger, automatic, G. Reddish	962,721
Wheel construction, C. A. Frick	962,631
Wheel coupling, grinding and polishing, M. Cummins	962,627
Wheel guard, A. Fiedler	962,826
Wind shield, E. S. Adams	962,406
Window seat, T. S. Richardson	962,468
Window tent, C. A. Hercules	962,707
Wire fabric, W. F. White	962,541
Woven fabric, asbestos faced, G. H. Smith	963,013
Wrapper, tubular, H. J. Blocki	962,614
Wrench, J. A. Bledsoe	962,738

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., Inc., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., Inc., 361 Broadway, New York.

(*Concluded from page 38.*)

bottom in a depth of 50 feet. In such work the spoil can be dumped into cars both at the upper and lower levels.

At the Pillinge brickfields the machine has shown itself to be more than adequate for requirements, so that an opportunity has not been available to test its maximum output. Its normal working however is one complete operation per minute. In this case the capacity of the bucket is double that of the carrying wagons used, so a special dividing hopper has been evolved, beneath which the wagons are run, and the bucket discharged into the hopper. In this manner each swing of the dredger arm enables two wagons to be filled to their maximum capacity. In this particular instance the machine is able to fill 400 wagons, each of 1½ cubic yards, representing 700 tons in a single shift. This means the supply, including both excavating and loading, of sufficient clay to produce 1,500,000 bricks per week at these works, which is stated to constitute a record output for any single machine. The capacity of the machine naturally varies according to the nature of the material to be excavated, and the existing facilities for disposing of the spoil. While the one complete operation per minute at first sight appears somewhat slower than the usual plant, there is the compensating advantage that a bucket of larger capacity can be used, in addition to the fact that owing to the depth of the cutting face of the bank, there is always the certainty of filling the bucket to its maximum. The plant has been in service for some months and has proved the means of solving a problem confronting the owners for some years past, of obtaining complete and uniform mixture of top and bottom clay in one cut. In addition the system is very clean in its work, so that there is no further clearing at the foot of the bank necessary before advancing the machine. The simplicity of the control of the various motions is also such that one engineer can manipulate the excavator with complete ease.

AN IMPROVED BOOMERANG.

(*Concluded from page 31.*)

category belongs the cross-shaped boomerang, which is used by several tribes and which an English inventor, A. Dashwood Lang, has succeeded not merely in imitating, but in improving to a remarkable degree. The Australian cross-shaped boomerang is formed of two strips of hard wood, one six and the other eight inches long, fastened together in the form of a cross and with their edges cut into a series of curves of about 120 degrees. After having practised throwing this boomerang for many years, Dashwood Lang has invented an improved form, greatly superior to its prototype, which he calls the "curva."

In appearance the curva is only a wooden cross with its length one-third greater than its width, but this simplicity of form is only apparent, as anyone can prove to himself by constructing a simple cross of these proportions and throwing it. It will accomplish a flight not exceeding seventy feet, and will not return to the thrower. When the curva, on the other hand, is thrown at an object 100 feet distant, it will graze the object, then swerve to the left (if thrown with the right hand) and return to the hand of the thrower. In throwing the curva, the end of the long arm is held between the thumb and index finger, and the plane of the cross is kept vertical. As soon as it leaves the hand, it begins to turn toward the left and gradually assumes a horizontal position, at the same time rotating rapidly in its own plane. The velocity of rotation gradually increases, and attains its maximum at the instant when the curva reaches the top of its flight, and begins to descend and to return toward the floor. The accompanying photographs illustrate three stages of this strange flight. Fig. 1 shows the launching of the curva on its course. Fig. 2 shows the mysterious projectile just after it has turned round the goal and has commenced its return journey, and Fig. 3 shows the completion of its return to the hands of the thrower.

This interesting scientific toy suggests vast and vague possibilities. In comparison with the parabolic boomerang, which was introduced to the sporting world a few years ago without meeting with a favorable reception, the curva presents the great advantage of not requiring long practice. A novice soon learns to throw it in such a manner as to produce very curious evolutions, and after a few attempts he can make the curva describe two complete loops in the air before it returns to the point of departure. The flight can be varied astonishingly after the player has learned to estimate the force of the throw and to introduce a twist of the wrist which can be acquired only by practice. Air currents exert a curious influence upon the flight but, very remarkably, do not prevent the return to the point of departure. The inventor has described to the writer a flight in which the curva, at the turning point of its journey, encountered a gust of wind. It remained motionless, but in rapid rotation, in the air for half a minute, as if it were waiting for the wind to cease. Then it resumed its course and returned to the hand of the thrower as if nothing had happened, the direction of its flight not being changed by the gust of wind.

The Current Supplement.

Some new and improved devices for fish culturists are described in the opening article of the current SUPPLEMENT, No. 1801.—The announcement of plans prepared in the United States for a battle-ship of 30,000 tons has naturally been the subject of a great deal of discussion in England, where so far no battleship has yet been laid down with a greater displacement than 20,250 tons. A critical consideration of this American project from an English point of view is presented.—Dr. E. E. Barnard contributes a most interesting article on nebulae, in which he discusses the curious phenomenon of the veiling of certain stars, which would lead to the conclusion that possibly there may be some interplanetary matter which cuts off the light of luminous celestial bodies.—The India-rubber industry is discussed by Dr. Philip Schidrowitz.—William E. Snow explains the elementary theories of the steam turbine.—The conditions essential to the maintenance of the inhabitability of the earth are many, but the more critical factors either lie in the atmosphere itself or are intimately associated with it. Since these elements are changing, it necessarily follows that the habitability of the earth is changing. The question is considered by Prof. T. C. Chamberlin in an article entitled "A Geologic Forecast of the Future Opportunities of our Race."

Guiding Signals for Aeronauts.

Attempts have already been made in France to provide guiding signals for aeronauts by marking the names of towns in large letters on the roofs of buildings. The same method is being introduced in Germany through the efforts of Dr. von Oechelhaeuser, who has devised a system of signals which will be submitted to the International Aeronautic Federation at its next meeting. In this system countries and provinces are designated by serial numbers, and towns by combinations of two letters. The tops of gas tanks, which are painted black, are especially suitable backgrounds for the large white characters of the signals. One gas tank at Dessau in Anhalt has been marked with the serial number of the province, 75, in figures 33 feet high, and another with the name Dessau, in letters 13 feet high, with an initial capital letter 20 feet high. This name has been read distinctly, in not very clear weather, from a balloon at an elevation of 1,300 feet.

ELGIN WATCHES ON CREDIT

17 Jewel Elgin—Our Great Special Sent Anywhere on FREE TRIAL $13.75

Guaranteed to keep accurate time. Fitted in double stock gold-filled case, any style engraving, warranted for 20 years. You do not pay one penny until you have seen and examined this High-Grade 17-Jewel Elgin Watch, in any style hand-engraved case, right in your own home. Let us send it to you, all charges prepaid. If it suits you Pay Only $1.50 a Month We trust every honest person. No matter how far away you live, or how small your salary or income, we will trust you for a high-grade Elgin Watch, in gold case, warranted for 25 years, and guaranteed to pass any Railroad inspection. Write for our big free Watch and Diamond Catalog It tells all about our Easy Payment Plan and how we send Elgin 19-Jewel B. W. Raymond and 21 and 23 Jewel Elgin Veritas; also Waltham Watches, 19, 21, and 23 Jewel, 16 and 18 sizes, anywhere without security or one cent deposit. Send today for the Loftis Magazine, Free.

LOFTIS BROS. & CO. THE OLD RELIABLE ORIGINAL DIAMOND AND WATCH CREDIT HOUSE Dept. G-190 92 to 98 STATE ST., CHICAGO, ILL. Branches: Pittsburg, Pa., St. Louis, Mo.

SEALED PROPOSALS.

WANTED—One first-class ordnance draftsman at $5.04 per diem. A competitive examination will be held July 14, 1910, for the purpose of filling the above position. For further information address "Commandant, Navy Yard Station, Portsmouth, Va."

ICE MACHINES Corliss Engines, Brewers and Bottlers' Machinery. THE VILTER MFG. CO., 899 Clinton St., Milwaukee, Wis.

MODELS & EXPERIMENTAL WORK. Inventions developed. Special Machinery. E. V. BAILLARD CO., 24 Frankfort Street, New York.

CONSULTING ENGINEER. ERNEST L. RANSOME Reinforced Concrete 910 Madison Avenue, Plainfield, N. J.

RUBBER Expert Manufacturers Fine Jobbing Work PARKER, STEARNS & CO., 288-290 Sheffield Av., B'klyn, N. Y.

MODELS CHICAGO MODEL WORKS 175 E. MADISON ST. CHICAGO, ILL. ESTABLISHED 1867 ILLUSTRATION CATALOGUE 25 CENTS (REFUNDED)

SOUTHERN STAMPING & MFG. CO. Manufacturers of special and patented articles. R. 8., Nashville, Tenn.

DRAWING MATERIALS E. G. RUFFLE & CO., Manufacturers 119 Fulton Street, New York, U. S. A. We Do Repairing of all Kinds of Instruments

Machine Work Wanted Special or Staple Articles Manufactured in Quantities H. G. KOTTEN CO., 80 Church Street, New York City

DRYING MACHINES For Granular Material S. E. WORRELL Hannibal, Mo., U. S. A.

SCHWERDTLE STAMP CO. STEEL STAMPS, LETTERS & FIGURES BRIDGEPORT, CONN.

MASON'S NEW PAT. WHIP HOISTS save expense and liability incident to Elevators. Adopted by principal storehouses in New York & Boston Manfd. by VOLNEY W. MASON & CO., Inc. Providence, R. I., U. S. A.

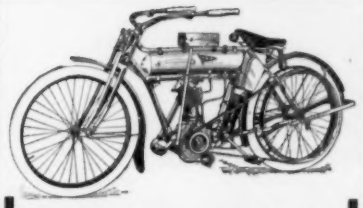
How to Construct An Independent Interrupter

In SCIENTIFIC AMERICAN SUPPLEMENT, 1615, A. Frederick Collins describes fully and clearly with the help of good drawings how an independent multiple interrupter may be constructed for a large induction coil.

This article should be read in connection with Mr. Collins' article in SCIENTIFIC AMERICAN SUPPLEMENT, 1605, "How to Construct a 100-Mile Wireless Telegraph Outfit."

Each Supplement costs 10 cents; 20 cents for the two. Order from your newsdealer or from

MUNN & CO., Inc., 361 Broadway, New York



The Ever-Consistent Yale

Nichols, one of the three Yale riders in the 375-mile Endurance Contest held by the New Jersey Motorcycle Club, May 30-31, 1910, *was awarded the Silver Trophy Cup for the most consistent performance of the 65 contestants.*

The YALE team—as usual—achieved a perfect score.

3½ H. P. *Single Cylinder* $200 F.O.B. Toledo

YALE

6½ H. P. *Twin Cylinder* $300 F.O.B. Toledo

The long stroke motor, specially heat-treated cylinder ground to .001 of an inch, made these feats possible. All YALE motors are stock motors.

Sworn statement of average upkeep cost in 1909 for all repairs—29 cents.

IMMEDIATE DELIVERIES *Write for Booklet Today*

The Consolidated Mfg. Company 1741 Fernwood Ave., Toledo, Ohio, U. S. A.

Remoh Gems

Looks like a diamond—wears like a diamond—brilliancy guaranteed forever—stands filing and fire like a diamond—has no paste, foil or artificial backing. 1-20th the cost of diamonds. Set only in solid gold mountings. A marvelously reconstructed gem. Not an imitation. Guaranteed to contain no glass. Sent on approval. Write for catalog. It is free.

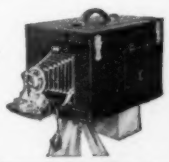
REMOH JEWELRY CO., 453 S. Broadway, St. Louis

Experimental & Model Work *Cir. & advice free.* Wm. Gardam & Son, 221 Fulton St., NY

Magical Apparatus. Grand Book Catalogue. Over 700 engravings 25c. Parlor Tricks Catalogue, free. MARTINKA & CO., Mfrs., 493 Sixth Ave., New York

TELEGRAPHY TAUGHT In the shortest possible time. The Omnigraph Automatic Transmitter combined with standard key and sounder. Sends you telegraph messages at any speed just as an expert operator would. Five styles, $ up; circular free.

OMNIGRAPH MFG. CO. 39R Cortlandt St., New York



500% PROFIT

Operating a Daydark Photo Post Card Machine. Three photo postal cards of any object made and delivered on the spot in ten minutes. No experience required—no dark room necessary. All work done in the machine in open day. Establish a profitable business at home by opening a Daydark Postal Parlor. Big money maker on the street, at fairs, etc. Send at once for free catalog and sample post card showing the fine work the machine does.

Daydark Specialty Co. 426 Temple Bldg., St. Louis, Mo.

NOW READY

THE SCIENTIFIC AMERICAN HANDBOOK OF TRAVEL

With Hints For the Ocean Voyage

FOR EUROPEAN TOURS

AND A PRACTICAL GUIDE TO LONDON AND PARIS

By ALBERT A. HOPKINS

Editor of Scientific American Reference Book

500 PAGES 500 ILLUSTRATIONS FLEXIBLE COVER, $2.00 FULL LEATHER, $2.50, POSTPAID

AT last the ideal guide, the result of 20 years of study and travel, is completed. It is endorsed by every steamship and railroad company in Europe. To those who are not planning a trip it is equally informing. Send for illustrated circular containing one hundred questions out of 2,500 this book will answer. It is mailed free and will give some kind of an idea of the contents of this unique book, which should be in the hands of all readers of the SCIENTIFIC AMERICAN as it tells you exactly what you have wanted to know about a trip abroad and the ocean voyage.

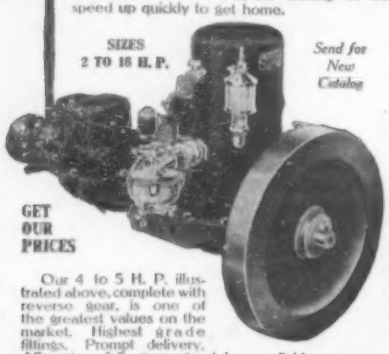
WHAT THE BOOK CONTAINS

500 Illustrations
6 Color Plates
9 Maps in pocket
Names 2,000 Hotels, with price
All About Ships
"A Safer Sea"
Automobiling in Europe
The Sea and Its Navigation
Statistical Information
Ocean Records
400 Tours, with prices
The Passion Play
Practical Guide to London
Practical Guide to Paris

MUNN & COMPANY, Inc., Publishers, 361 Broadway, New York, N. Y.

BELLE ISLE MARINE ENGINES

Strictly high quality engines: Noted for power, speed—high efficiency and comparatively light weight. Perfect control. Can be checked down instantly for trolling—or will speed up quickly to get home.



Our 4 to 5 H. P. illustrated above, complete with reverse gear, is one of the greatest values on the market. Highest grade fittings. Prompt delivery. All engines fully guaranteed by a reliable company. Be sure you have full information about Belle Isle Engines before placing your order elsewhere.

NEW BELLE ISLE MOTOR COMPANY
DEPT. D DETROIT, MICH.

Rider Agents Wanted

in each town to ride and exhibit sample 1910 bicycle. *Write for Special Offer.*
Finest Guaranteed 1910 Models **$10 to $27**
1908 & 1909 Models all of best makes **$7 to $12**
100 Second-Hand Wheels *All makes and models, good as new* **$3 to $8**
Great FACTORY CLEARING SALE
We **Ship on Approval** *without a cent deposit, prepay freight* and allow **TEN DAYS FREE TRIAL.** We **TIRES**, coaster brake rear wheels, lamps, sundries, *half usual prices.* Do not buy till you get our catalogs and offer. *Write now.*
MEAD CYCLE CO., Dept. S 175 Chicago

The Victor Gas or Gasoline Engine

The illustration shows the beautiful little **Victor** Gas or Gasoline Engine, 1¼ Horse Power, 4 Cycle, Water Cooled, Mechanically operated Valves, **Schebler Carburetor, Splitdorf Coil,** Polished Copper combined Water and Gasoline Tank, Polished Brass Governor.

This is one of the finest little engines ever made. Send for circular.

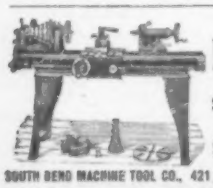
Victor Vacuum Cleaner Co.
YORK, PA.

Use A FOX MOTOR In Your Boat
Fox Motors

Holds the WORLD'S Endurance Record
Made in 16 Sizes. 3½ to 80 H. P.
30 Days' FREE Trial. 5 Years' Guarantee
THE DEAN MFG. CO.
213 Front Street, So. Cincinnati, Newport, Ky.

Free Interesting
Lathe Book

DESCRIBING
SOUTH BEND LATHES
6 to 14-in. swing
$25.00 and up



SOUTH BEND MACHINE TOOL CO., 421 Madison St., South Bend, Ind.

LEARN PLUMBING

A trade that will make you independent for life. **Hours Shorter—Pay Bigger—Demand Greater** than most any trade. You need no previous experience. Our practical methods enable you in a few months to hold position as a skilled plumber or conduct your own business. Catalog sent free.

BIG PAY SHORT HOURS

St. Louis Trades School
4428 Olive St. St. Louis, Mo.

Incorporate

Your PATENTS and BUSINESS in ARIZONA

Laws the most liberal. Expense the least. Hold meetings, transact business anywhere. Blanks, By-Laws and forms for making stock full-paid for cash, property or services, free. President-Stoddard, FORMER SECRETARY OF ARIZONA, resident agent for many thousand companies. Reference: Any bank in Arizona

STODDARD INCORPORATING COMPANY, Box 8000
PHOENIX, ARIZONA

DIE MODELS SPECIAL
WORK TOOLS MACHINERY
NATIONAL STAMPING AND ELECTRIC WORKS
1001 Jefferson Street, Chicago, Ill.

HELMET OIL LUBRICATES ANYTHING SEND FOR SAMPLE FREE
15-21 S. CLINTON ST. CHICAGO U.S.A.
C. H. BESLY & CO.

Here's the U. S. Incinerator
Officially Adopted by the U. S. Government and ordered for Army Purposes

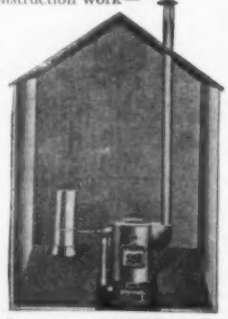
If you are a contractor employing men in excavating and construction work—
If you operate a mine or lumber camp—
If you are in charge of a hospital, sanatorium, or any institution housing people, you should at once investigate the wonderful simplicity, superiority and advantages of the U. S. Incinerator.

The United States Incinerator Equipped as a Toilet

U. S. Incinerators provide for accumulating and disposing of excreta and all forms of waste, conveniently and economically; and in a sanitary manner.

They can be used either separately as a single toilet, or in batteries accommodating any number of persons.

The U. S. Incinerator totally destroys excrement and all forms of waste with a sanitary and odorless incineration, **positively emitting no odor either during accumulation or incineration.**



Reverse view of installation in the floor, showing firing side and position of incinerator.

Sectional View of Incinerator

Indispensable to hospitals—cremates dressings, bandages and infectious parts from operations, sputum cups, etc.—takes the place of garbage can and waste collector—portable, economical and requires no special attention.

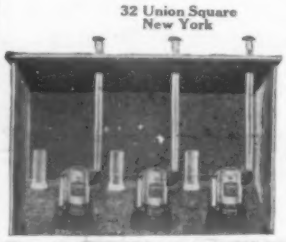
It also solves the toilet and garbage problem in country homes, private houses, hotels, summer resorts, factories, railroad stations and all places where sanitary destruction of waste or refuse matter is essential.

Write us today for full and complete information as to how it can best be applied to your particular purpose. We will either refer you to agent in your locality, or send one of our representatives to see you personally if you desire; but write us now that we may place before you without delay valuable information and complete facts regarding this wonderful device.

Trap Door Installation

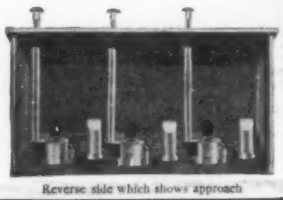
UNITED STATES INCINERATOR COMPANY, Inc.
EXECUTIVE OFFICE, 429 WHITE BUILDING, BUFFALO, N. Y.

OFFICES AT
32 Union Square, New York
217 Chamber of Commerce Bldg., Chicago, Ill.
2120 First Avenue, Birmingham, Ala.



Firing side. Battery of three equipped as toilets

Hardware Dealers wanted everywhere to represent us. Write for terms



Reverse side which shows approach

Chicago Beach Hotel

American Plan | Finest Hotel on the Great Lakes | European Plan

An ideal resort uniting all city gaieties with the quiet of country and seashore. Delightfully situated on the shore of Lake Michigan close to the great South Park—10 minutes' ride from the theatre and shopping district. Every comfort—cool, refreshing breezes—smooth, sandy bathing beach—all summer attractions. Tourists and transients always find it a most attractive place to stop and rest. For Handsomely Illus. Booklet address Manager, 51st Blvd. and Lake Shore, Chicago

16-ft. Steel Launch $96

Complete with Engine, Ready to Run

18-20-23-27 foot Launches at proportionate prices. All launches tested and fitted with Detroit two cycle reversible engines with speed control-ling lever—simplest engine made—starts without crank-ing—has only 3 moving parts—anyone can run it. STEEL ROWBOATS $20.00. All boats fitted with air-tight compartments—cannot sink, leak or rust—need no bailing. We are the largest manufacturers of pleasure boats in the world and sole owners of the patents for the manufacture of rolled steel, lock seamed, concealed riveted steel boats. Orders filled the day they are received. Write for Free Illustrated Catalog and testimonials of 10,000 satisfied users.

Michigan Steel Boat Co., 1332 Jefferson Ave., Detroit, Mich.

If you ever longed to have a boat of your own, send for our boat catalogue

YOU will find just the motor boat, sailboat, rowboat, or canoe you want. You will be amazed at the low cost of the boat if you buy it by the Brooks System. You can save the biggest part of the cost by building a part of the boat yourself.

Don't say you cannot do it until you have read our catalogue—our guarantee of satisfaction makes failure on your part impossible. 83,000 men and boys have built boats by the Brooks System. Let us show you how we can serve you by our boat helps and K. D. frame bargains.

Ready to run				K. D.	Ready to run	K. D.
$300.00 18-ft.	motor boat,	2 h.p.	eng.	$107.25	$250.00 22-ft. cat boat	$113.35
350.00 23-ft.	" "	4 h.p.	"	127.25	55.00 16-ft. clinker rowboat . .	20.00
500.00 25-ft.	" "	6 h.p.	"	174.00	60.00 16-ft. canoe	20.00
600.00 18-ft.	" "	8 h.p.	"	239.00	40.00 15-ft. duck boat	15.95

Ask for boat catalogue No. 24

Brooks Mfg. Co., C. C. Brooks, President
407 Rust Avenue, Saginaw, Mich.

THE LITTLE CAMERA of BIG POSSIBILITIES

The No. 0 Graphic

THIS little camera is **fixed focus**—everything within its range is absolutely sharp.

It is fitted with a high grade, high speed Anastigmat Lens, working at f-6.3 and a Graflex Focal Plane Shutter actuated to give any speed from "time" to 1/500th of a second.

The negatives made with the No. 0 Graphic show such wonderful definition that they may be enlarged to many times the original size and still retain all the brilliancy of the contact print.

This is the exact size of picture made with No. 0 Graphic

Send for Booklet
FOLMER & SCHWING DIVISION
Eastman Kodak Company
ROCHESTER, N. Y.

FISHING REEL ROD LINE

all need "3 in One" oil. It makes reels run right—ALWAYS. No sticking, no jerking, no backlashing. Just an easy, steady action that feeds or reels the line evenly, smoothly at any speed.

"3 in One" prevents rust on steel rods, prevents cracking of cane or bamboo rods and makes all joints fit snugly. Makes silk or linen lines stronger and last longer. Prevents twisting and tangling.

FREE Try "3 in One" yourself at our expense. Write at once for sample bottle and booklet—both free. Library Slip in every package.

3 IN ONE OIL CO., 14 Broadway, New York.

CRUDE ASBESTOS
DIRECT FROM MINES

PREPARED ASBESTOS FIBRE for Manufacturers use

R. H. MARTIN,
OFFICE, ST. PAUL BUILDING
220 B'way, New York

Star Hack Saw Blades

are highest in quality and lowest in price. These two features work well together. The blades which we are now turning out are the best we have ever made. You can satisfy yourself that this statement is no exaggeration by remitting to us 34c. for a sample dozen of 8-inch, or 42c. for 10-inch, or 50c. for 12-inch. Postage free.

MILLERS FALLS COMPANY, 26 Warren St., New York, N. Y.

PRINT Your Own Cards, circulars, book, newspaper. Press $5. Larger $18 Rotary $60. Save Money. Print for others, big profit. All easy, rules sent. Write factory for press catalog, TYPE, paper, &c.
THE PRESS CO., Meriden, Conn.

MAKE YOUR BICYCLE INTO A MOTORCYCLE

At small cost by attaching the **ERIE** Attachment which includes all parts so that any one can make a strong machine that will climb steep hills and run for ½c. a mile. Sample at cost. Send 2c. stamp for Catalog 8 and special price.

MOTORCYCLE EQUIPMENT COMPANY, Hammondsport, N. Y.

DON'T BUY GASOLINE ENGINES

UNTIL YOU INVESTIGATE "THE MASTER WORKMAN," a two-cylinder gasoline, kerosene or alcohol engine, superior to any one-cylinder engine; revolutionizing power. Its weight and bulk are half that of single cylinder engines, with greater durability. Costs Less to Buy—Less to Run. Quickly, easily started. Vibration practically overcome. Cheaply mounted on any wagon. It is a combination portable, stationary or traction engine. SEND FOR CATALOGUE. **THE TEMPLE ENGINE MFG. CO., 496 West 15th St., Chicago.** THIS IS OUR FIFTY SIXTH YEAR.